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Contents

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Event and Comment.

Feeding Cows for Profit.

BETTER and regular feeding of milking cows not only increases dairy production, but adds substantially to farm income. Both increased output and profit depend on right feeding, and if feed has to be bought then its cost should be on a basis of sound economy. Grass, green fodder, and home-grown silage are the cheapest of cattle foods. If feeds in concentrated forms also are available, so much the better, but at present many of them are either in short supply or unobtainable. The food requirements of dairy cows may be ensured, however, by improved pastures and the growing of lucerne, clover, oats and millet for grazing, cow peas, field peas and vetches.

Under-feeding increases the cost of every gallon of milk and so reduces the profit. All hand-feeding should be by weight and not by guess. Seasonal conditions and circumstances permitting, the dairy farming programme should be so arranged that the supply of milk-making fodder is continuous and sufficient. Three important restrictive factors in dairy production are poor cattle, insufficient feed, and lack of balance in the feed.

Another important point in dairy practice is that high production cannot be obtained from dairy cows which are allowed to calve while in poor condition. Feed invested in building up a dairy herd, and especially in the building up of cows before they calve, is never a loss; it is an investment that usually pays for itself many times over.

Healthy Herds and High Production.

WHEN cows are sick or suffering from any disability, it is not fair to expect them to give the same amount of milk they yield when they are well. As every dairy farmer knows, cow-keeping is a study on its own, and to get the most out of a dairy herd it is necessary to acquire as much practical knowledge as possible and apply that knowledge in the running of a dairy farm. The study of the business starts when the calf is born. To give the calf a good start in life, it should be properly fed to ensure its satisfactory growth and general development. A stunted animal is not a normal animal, and no farmer wants anything but a normal animal in the replacement section of his dairy herd. After doing all that can be done in the way of providing the right feeds, and also providing for proper feeding, it is necessary to be watchful for any indication of worms in the calf, or the oncoming of any ailment to which calves are susceptible, and which may prevent its growth into a profit producing cow.

Probably stomach worms, lung worms, blood scours, calf pneumonia, and blackleg are the most common causes of setbacks in the life of a calf, so obviously, in the event of the occurrence of any of these troubles, it is wise to be prepared for suitable treatment—having always the right remedies on hand. As in everything else, however, prevention is always better than cure. Most dairy farmers have a fund of practical knowledge of the ways and means of either preventing or treating ordinary stock ailments; in any case, the district dairy instructor is willing to help with advice and skilful treatment, if veterinary assistance is unavailable.

Health in the dairy herd and quality production go together. Every dairy herd should be tested for T.B. and contagious abortion, and all positive reactors destroyed to avoid the risk of these diseases spreading throughout the herd, and to neighbouring dairy herds. Mammitis is another curse in a dairy herd, and everything should be done to prevent, or limit, its occurrence. This disease costs the Queensland dairy industry an immense amount of money every year, and no available means of eradicating it when it does occur should be neglected. On every dairy farm there should be an isolation or "hospital" paddock for sick stock. Suitable medicine chests, and instruments and other necessary equipment, should be kept in a handy and safe place in every dairy.

Milk may be fittingly described as one of the country's greatest liquid assets. It is plain, therefore, that as a healthy herd means high production, everything should be done that can reasonably be done to keep dairy herds healthy. Healthy herds, quality production, and more production are a national need—a need greater now than at any other period in Australian history.

Grain Sorghums.

C. J. McKEON.

ALTHOUGH grain sorghums have been grown in Queensland for many years past, it is only during recent years that this crop has become an important one in Australia's rural economy; that is, from the point of view of producing the grain to be marketed in the same way as is maize and wheat for stock feeding purposes.

For very many years maize and wheat have been our chief grain crops and while it is not suggested, nor is it desirable, that grain sorghums shall displace either of these very valuable grain crops, the ability of grain sorghums to produce good crops of grain under climatic conditions which would be fatal to many other crops justifies the belief that they will become one of the chief grain crops in some districts. By some districts, is meant those districts in which maize growing for grain is risky because of unreliable rainfall.

Introduction of Dwarf Varieties.

The remarkable development of grain sorghum growing during the last few years followed the introduction of dwarf types which can be mechanically harvested. Prior to the introduction of these short growing types, only the tall varieties were in cultivation. The height of these varieties made it necessary to harvest them by hand; harvesting costs were therefore heavy, so their production was limited to small, or comparatively small, areas for use on the farm on which they were grown. Now the position is different, as very large areas can be produced on individual farms, this being possible by the fact that they are harvested with a header, the same as is wheat.

The introduction of the dwarf types was made by the Queensland Department of Agriculture in 1932 and 1933 from Departments of Agriculture in the United States of America, South Africa, and Egypt. Many varieties were introduced and, after trials continuing over several seasons, the varieties Kalo, Wheatland Milo and Hegari, each of which can be mechanically harvested, proved highly suitable and are now the most extensively grown.

Although considerable work has been done by Australian plant breeders in making selections to suit local conditions since their introduction, full credit should be given to the plant breeders in the

countries in which these varieties were evolved. Remarkably high yields of grain are obtained from these varieties. Last season, yields up to 120 bushels per acre were harvested from some crops, and while admittedly this may be an unusually high yield, yields in the vicinity of 90 bushels an acre are frequently obtained.

Crop Expansion in Queensland.

The following figures indicate how rapidly the grain sorghum growing is expanding in Queensland:—For the season 1941-42, the area sown was 25,340 acres and the yield 353,000 bushels. For 1942-43, the area sown was 40,618 acres and the yield 730,000 bushels. For 1943-44, the area sown was 54,690 acres and the yield 1,400,000 bushels. In addition to those acreages considerable areas were sown and fed to stock on the farm, either by grazing the crop off with sheep or cattle, or by harvesting the grain and retaining it for use on the farm.

It is confidently anticipated that production during the coming season will show a substantial increase over that for the previous season. The crop objective set is 3,000,000 bushels for Queensland, and there is every reason for optimism as to the prospects of this objective being attained, providing, of course, weather conditions are favourable.

Grain Sorghums Increase Food Production.

Realising the importance of the grain sorghums on the maintenance of essential food production, the Commonwealth Government is prepared to enter into contracts with growers at the attractive price of 3s. 7d. per bushel of 60 lb.

No single industry has benefited to a greater extent from increased grain sorghum cropping than the poultry industry. During the past year, sorghums not only made it possible to greatly increase egg production, but at times prevented a collapse of the industry when other grain was unavailable for manufacturing feeding mashes. One organisation alone—one of the largest distributors of poultry foodstuffs in Australia—used approximately half a million bushels of grain sorghums. This quantity would be sufficient to provide for, approximately, 300,000 fowls for a whole year.

In Queensland, for September of this year, egg production was 25 per cent. greater than for the previous month, and was 30 per cent. greater than for September of last year. Had it not been for the 1½ million bushels of grain sorghum which were available at a critical period, these results could not have been achieved.

For the coming year, the egg production objective for Queensland has been set at 8½ million dozen within a region of which Bundaberg is the northern limit, and it is hoped that seasonal conditions will be favourable so that the maximum production of grain sorghums will be possible to ensure the attainment of this target.

It would not be possible to estimate the extent to which grain sorghums have affected the production of lamb and mutton, but it would be very considerable. Large areas are sown specifically for that purpose and the number of sheep which can be grazed for a considerable period on each acre of mature sorghum has to be seen to be appreciated. Even crops, from which the grain has been harvested, are of considerable

value for grazing sheep. Apart from the grain which has been missed during harvesting, the stalks are still green when harvesting is finished and make very useful grazing.

The value of grain sorghums for raising and fattening bacon pigs is now fully appreciated, especially in the districts in which the sorghums are produced.

As other States of the Commonwealth, besides Queensland, are closely interested in the further development of this excellent crop, it is believed that grain sorghums will soon be established as a definite and increasingly valuable contribution to the agricultural economy of the Commonwealth.

RECENT PUBLICATIONS.

THE QUEENSLAND AGRICULTURAL AND PASTORAL HANDBOOK—

Vol. I.—Farm Crops and Pastures . . . . Price, 5s., Post Free
Vol. II.—Horticulture . . . . . Price, 4s., Post Free
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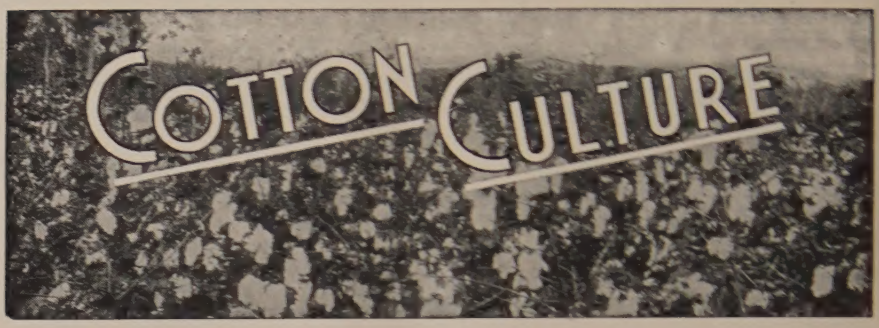
Enquiries for advisory literature on other subjects would be welcomed.

Because of paper restrictions, inquirers are requested to apply only for the publications they actually need.

All applications for departmental publications should be addressed to **The Under Secretary, Department of Agriculture and Stock, Brisbane.**

Plate 94.

AFTER THE STORM.—Near Macalister, Northern Darling Downs, Queensland.



Growing Cotton with Supplementary Irrigation.

W. A. R. COWDRY, Acting Manager, and N. H. ADAMS, Field Assistant, Biloela Research Station.

THE Queensland cotton crop is mostly produced in districts receiving an average annual rainfall ranging from 26 to 35 inches, with much of the acreage in the 28 to 30 inch rainfall belt in the south-eastern part of the State. The results of investigations and demonstrations conducted in these districts over the last 20 years have indicated that where proper rotations and cultural operations are practised on soils suitable for cotton, good yields can usually be obtained in this area under rain grown conditions. In most seasons, however, the investigations have indicated that additional moisture at critical periods in the development of the cotton crop would have materially improved the yields.

The Queensland Government therefore decided in 1940 that the merits of growing cotton with supplementary irrigation obtained from both surface and underground waters should be investigated, and, as a part of the programme, irrigation facilities were provided at the Biloela Research Station through the development of a supply of well water to irrigate 8 acres by means of tractor powered equipment. The investigations conducted at that centre in the following four years comprised varietal trials to ascertain the most suitable variety for growing with supplementary irrigation in the Callide Valley, tests of the merits of growing cotton with and without supplementary irrigation, tests of the merits of furrow and spray irrigation, and studies for the determination of the best periods to apply irrigation. While much investigational work remains to be done, sufficient progress has been achieved in the investigations to warrant the presentation of a brief summary of the results to date.

Varietal Trials.

The varietal trials have embraced various strains of Miller—the main variety grown in the Callide Valley without supplementary irrigation—New Mexico Acala, Indio Acala, Farm Relief, Stoneville 5, and Rowden 40-6-F. 3. The results have been in keeping with those obtained in rain-grown varietal trials, i.e., the quicker fruiting, heavy yielding, fine fibred Farm Relief and Stoneville were affected more by high temperatures and had more exacting water requirements than the

slower fruiting coarser fibred types like Miller and New Mexico Acala. Consequently the finer fibred varieties showed wider fluctuations in boll size, yields and quality of fibre than the coarser fibred types.

Although not always the leading producers, the yields in pounds of seed cotton per acre obtained from Miller and New Mexico Acala respectively:—1940-41, 1,792-1,845; 1941-42, 2,028-1,928; 1942-43, 1,099-1,202; and 1943-44, 1,851-1,822—in conjunction with the size of boll and the quality of fibre produced, make either of these varieties suitable for growing with supplementary irrigation on the heavy loams and clay loams of the Callide Valley. These varieties would not be as suitable, however, as the quicker flowering Triumph, Farm Relief and Stoneville, for the more fertile alluvial sandy and heavy loams of the general Burnett and West Moreton districts.

Irrigated Versus Non-Irrigated Cotton.

The results of the comparisons of irrigated and non-irrigated cotton have given most conclusive evidence of the value of growing cotton—on the soil type concerned—with supplementary irrigations during seasons of such irregular rainfall as have been experienced during the four years of this experiment. In all four years the availability of irrigation facilities has allowed of earlier planting, which, with more subsoil moisture and the application of water during stress periods at mid-season, gave improved yields of seed cotton, as evidenced in Table I.

TABLE I.

	Irrigation Cotton		Rain-grown Cotton	
	Time of planting	Yield per acre	Time of planting	Yield per. acre
1940-41 ..	18th Oct.	1,456 lb.	14th Nov.	420 lb.
1941-42 ..	11th Oct.	1,721 lb.	14th Oct.	564 lb.
1942-43 ..	3rd Oct.	1,137 lb.	9th Nov.	489 lb.
1943-44 ..	14th Oct.	1,741 lb.	20th Oct.	653 lb.
Mean yield lb. seed cotton per acre		1,514		531

The soil type on which these experiments were conducted is fairly typical of the strip of medium to heavy loams generally adjacent to the creeks in the Callide Valley. The yields of the rain-grown cotton are not thoroughly indicative, however, of the possibilities of this form of cotton growing under the seasonal conditions experienced. On other parts of the Research Station, consisting of heavier loams and clay loams, appreciably better yields of rain-grown cotton were obtained during this period on cultivations in the first three seasons following grassland. Undoubtedly, however, supplementary irrigation is highly advantageous on soils suitable for this form of cotton growing.

Furrow Versus Spray Irrigation.

The results of the Biloela experiments indicate that, where the land can be graded so that the water will flow uniformly down the furrows without overflowing the ridges between them, as good yields of cotton can be obtained by applying the water in furrows as by the spray method of irrigating except in the case of very sandy soils. Where the field is either very undulating or very sandy, however, the spray method of irrigation allows of a more uniform application of water and, in the

case of sandy soils, of a better regulation of the amount of water applied than is possible with furrow irrigation. The spray method of irrigation requires more labour, however, due to the necessity to change the spray line.

Time of Application of Irrigation.

The experimental results indicate clearly the advisability of applying a preplanting irrigation in time to plant at mid-October. In a wet spring the irrigation may be timed to allow of planting in the first week of October, but in a dry spring there is always the danger of early planted cotton suffering serious terminal loss through attacks by insects which may concentrate on the young cotton—the only green growth that may be present. The reduced yields of irrigated cotton for the 1932-43 season presented in Table I. were the result of such an attack.

The preplanting irrigation should be an application of not less than 3 acre inches per acre, i.e., the amount of water required to cover an acre to a depth of 3 inches. The top six inches of the heavy loams and clay loams on which cotton is usually grown will normally contain very little moisture at the time of application of the preplanting irrigation and 3 acre inches will be required to wet an acre of such soils to a depth of 18 inches when they are in this dry state. It is advisable to have at least this depth of wet soil at planting time in order that the plants may grow steadily until January without additional moisture other than than supplied by the normal rainfall.

In January, the plants should be so heavily laden with squares and bolls that an irrigation will be necessary to provide their moisture requirements during the fortnight of hot, dry weather that usually occurs following the first week of that month. It is advisable, therefore, to apply at least a 3 acre inch irrigation early in January unless very heavy penetrating rainfall has been experienced during the last week of December. A good indicator to use in deciding if an irrigation is necessary early in January is the position of the top flowers on the plants. If the flowers are within a foot of the top of the plants at this stage of growth, it will be advisable to apply such an irrigation, otherwise plant growth will be checked quickly, with a consequent loss of crop during any following prolonged hot dry weather.

The water requirements of heavily laden cotton plants during hot, dry weather in January are so high that most of the available moisture in the top foot of soil is exhausted by the plants within a fortnight after this soil zone is wet—even to its full capacity to hold water. It is advisable, therefore, to give the plants a 3 acre inch irrigation a fortnight after the first irrigation in January, if hot dry weather has prevailed following that watering. The second irrigation in conjunction with the February rainfall, which, for most of the cotton growing districts, normally approximates 4 inches, should be sufficient to maintain satisfactory plant growth until March. If the second half of February is hot and dry, however, it will be advisable to apply a 2 to 2½ acre inch irrigation early in March to ensure continuation of plant growth and the proper development of the late middle and top crop of bolls. No further irrigation should be required, as the rainfall for March and April, in conjunction with the early March irrigation, will normally be sufficient to mature the crop.

The above indicated time-table of irrigations has been used at the Biloela Research Station in producing the yields reported in the varietal trials. The total rainfall during the growing period of the four years of trials was respectively 19, 29·5, 16·8 and 23·5 inches, or a mean of 22.2 inches, which, with the application of 11 to 11.5 inches of irrigation water would thus provide approximately 33 inches of water for the growing season. It is significant that investigations overseas have indicated that irrigated cotton requires roughly this amount of water. It is recommended that farmers growing cotton with supplementary irrigation should test the suitability of the time-table of application and the quantities of water used at the Research Station, for their soils.

Summary.

Investigations have indicated that good yields of rain-grown cotton can be obtained where proper rotations and cultural practices are followed. Evidence was obtained, however, that additional moisture during critical stages of plant development would have been beneficial in most seasons.

Irrigation facilities provided at the Biloela Research Station have allowed of investigations being conducted which have confirmed the value of supplementary irrigation over a four-year period of irregular seasonal conditions.

The results of irrigation varietal trials, methods of application of irrigation water and times of application are presented for the guidance of irrigationists following this form of cotton growing.

Plate 95.

An Earth Tank in the Brigalow Country, Wyaga, Goondiwindi.

Pineapples in North Queensland.

W. G. HANCOCK, Plants Inspector, Bowen.

THE improvement in pineapple culture developed during recent years is generally well known; in fact, it is doubtful if there is any fruit industry which has made so much progress in so short a time. Average crops per acre have been increased, the crop can be timed to mature within close limits, and the effective life of a planting has been lengthened. That bane of the farmer—"wilt"—nowadays causes little trouble. However, while the large amount of experimental work which has been done, mostly in the South, is equally applicable in principle in North Queensland, certain modifications in detail are indicated owing to different climatic conditions and growing for market rather than for the cannery.

As elaborated later, the climatic extremes of North Queensland, its torrential rains, its periods of hot dry weather, together with the high soil temperature during periods, all constitute special problems.

The Pineapple Plant.

The pineapple is a Monocotyledon, and belongs to the natural order Bromeliaceae. Many related plants are grown in bush houses. It has also in close relationship a number of plants leading a semi-aerial life on trees and rocks, such as orchids. Another of the Bromeliaceae, the "Spanish Moss" of Florida is entirely air dwelling. The pineapple bears no relationship to the cactus family, as popularly supposed.

In accord with this family relationship the pineapple's roots are intolerant of poorly-aerated soil conditions. It is a shallow-rooted plant thriving in a loose, moist medium.

It gives another indication of its ancestry in its habit of forming new roots from its ageing leaf axils. Under natural conditions these would be continually covered by accumulating layers of leaf debris. In cultivation it is often of benefit to shovel soil in amongst the butts of plants as they become older.

The leaves are specialised to make the most effective use of a sparse rainfall, and at the same time, by shading the soil, to keep it cool and moist and hinder evaporation. Even a heavy dew will provide an appreciable quantity of water to the roots.

Soil and Site.

The above brief examination of some points in the plant's status suggest that it will do best in a loose, open soil, well drained but moisture-retaining, and with a high humus content. In practice this description exactly fits those soils growing the best plants. A good crumbly sandy loam overlaying a moisture-retaining but well-drained subsoil is probably the ideal.

The plant is strongly influenced by the amount of available iron in the soil. The availability may depend on the degree of acidity of the soil. Broadly, in an acid soil the iron is available, while in the contrary case it is not.

However, it is often noticed that plants make very satisfactory growth in a newly-cleared soil. In this case the soil will be found to be rich in humus left by the recently cleared vegetation. While the humus lasts it will itself supply the plant with iron, but, after several years of exposure, the supply will be exhausted. This shows readily enough the necessity of humus.

Very heavy compact soils are not suitable, for reasons already advanced, and very sandy soils are usually deficient in nutrients and highly leached of iron and other elements; furthermore, they dry out too quickly.

In brief, the points to look for in choosing a pineapple soil are—perfect drainage, moisture, loose open texture, and a high humus content. In addition, a suitably acid reaction or one capable of being rendered so.

In choosing a site one naturally ignores any situation subject to flood, and, conversely, any site, such as a narrow ridge, which will become unduly dry during protracted dry weather. Land, either flat or with a gentle slope, is best in the tropics, where torrential rain will cause severe erosion on cultivated land with a pronounced slope. The aspect does not have such a pronounced effect as in the south.

Preparation.

Although the pineapple is a shallow-rooted plant, land should be carefully prepared. According to the nature of the soil, it should be broken up to a fair depth and worked to a good tilth. Some soils of a very sandy nature are often badly leached on the surface, while just below the usual plough depth there is a strata of similar texture but darker in colour and rather heavier. In such cases it is often advisable to turn up this heavier layer and incorporate it with the sandy top, thus enriching the latter with materials previously leached from it.

When sulphur is to be used (see later), it is evenly broadcasted over the prepared surface and lightly harrowed under. Old land will in all probability be deficient in humus, and every effort to rectify this will repay. In the drier districts this is not always a simple matter without irrigation. The summer is, of course, the normal period of growth of a green crop and is also the usual period for planting pineapples. If, however, a summer cover crop could be established early, and, as soon as this is ploughed under, a winter crop set, it should be possible to obtain a fair cover for the winter months and the land prepared for planting the following summer.

When it is intended to replant an old block of pineapples the old plants will provide a valuable source of humus if they can be cut up with a heavy rotary cultivator and allowed to rot. The late spring is a suitable time. The rotting process will be hastened and additional humus provided if a crop of cowpeas is sown amongst the rubbish and the whole lot ploughed under together. A dressing of superphosphate will augment the growth of the cowpeas, and, through that, become available to the pineapples.

Planting.

A factor of major importance in tropical agriculture is high soil temperature. This is a problem peculiar to the North Queensland latitude. Of course some plants will tolerate far higher temperatures than others, but few will thrive when the bare stem and the roots are subjected to soil temperature of between 130 degrees F. to 140 degrees F. on the surface. Optimum growth is probably made when with adequate moisture the surface is about 90 degrees F. A typical reading taken at 2 p.m. on a December day indicated that with a shade temperature of 84 degrees F. the bulb showed 90 degrees F. just buried in the shaded surface under thickly-growing pineapples; it was 132 degrees F. just buried in the unshaded soil.

This shows what widely different conditions are enforced on plants growing as individuals under cultivated conditions as distinct from those growing in their natural state. For instance, in a tropical rain forest scores of plants are revelling in warm, moist conditions produced by the mutual shading. When the forest is cleared, however, not many of them, other than a few of the dominant large trees, would flourish when planted in rows on the same ground. Even those which clamber out into the sunshine require their roots to be in a moist shaded soil. In a flower garden, also, if plants are set closely enough for the foliage to touch they will stand up to heat which would quickly wither them had they been set wider apart.

The principle is the same with pineapples. For practical considerations room must be left to work amongst them, but from the point of view of vegetative growth the closer, within reason, they are planted the better. It should also be remembered that in the tropics bare cultivated ground deteriorates very rapidly through the loss of the humus.

The standard planting in South Queensland is to plant Smoothleafs in double rows set 2 feet apart and Roughleafs in single rows. In each case the plants are 12 inches apart in the rows. The inter-row space in each case is 4 feet. The number of plants per acre in each case will be 14,520 and 10,890 respectively. In the tropics it would seem better to put the plants 12 to 14 inches apart in the rows and have the inter-row space 5 feet. The number of plants per acre, therefore, would be approximately 10,500 and 7,280 respectively.

Comment is sometimes heard that with this spacing it will not be possible, after the third crop, to get between the rows. This is answered by the fact that after three crops the fruit usually deteriorates in size and it becomes time to eradicate, renovate the soil, and replant, however it was planted, and it is poor business to deliberately set out to get two small crops when the fruit should be at its best, solely to be able to pick the third in comfort.

When laying out the rows consideration must be given to erosion and ease of working. In the tropics steep slopes are not advised. On a slight fall it is usually best to plant in short rows up and down the

slope so as to shed the water quickly into cross drains. A lot however will depend on the soil type. Short rows and sufficient tracks will assist in handling the crop. While in South Queensland a north-south alignment is best so as to allow even illumination to each side of the row, in the tropics east-west is preferable since a better shade effect is obtained in early forenoon and late afternoon.

The actual planting is fairly simple, but care should be taken to lay out and plant evenly. The obvious way is to first lay out any tracks and then peg out the land at 7 feet or 5 feet intervals. A planting wire is stretched between pegs and the plants set out at the correct intervals. A piece of iron rod beaten out flat at one end to a spear shape is a suitable planting tool. The work is much speeded up if the suckers are roughly laid out first. Excessively deep planting should be avoided.

Planting Material.

Tops from cannery fruit are often used in the South. In North Queensland, however, even if available, they would probably be unsuitable by reason of the higher soil temperatures, unless weather conditions at planting time were very favourable.

Slips, which are the growths from the fruit stalk, can be used if well developed, otherwise they may not stand up to the heat.

Suckers are the favoured planting material. They are best when of medium size. Very large suckers which are near to flowering are unsatisfactory, since they will flower and fruit before being properly established. The fruit will be too small to be of any value, and, furthermore, they seldom make strong plants; their suckers sprout from high up and usually wilt when bearing a fruit. It is obvious that a fair percentage of these will seriously reduce the yield from a plot. If through shortage of material they must be used they should be planted separately and set deep. But they are seldom satisfactory.

The best size of suckers are those which will flower about six to seven months after planting. A quicker rooting will ensue if a few of the base leaves are stripped off. If it is necessary to keep suckers for any length of time before planting, they should be spread out in shallow layers in the shade. If heaped up they will sweat and rot. Always sort into two lots, large and small, and plant separately. To have sections of the farm cropping evenly will facilitate later operations, and, furthermore, large plants tend to shade and smother small plants, to their detriment.

Sucker Selection.

If any new plantation is closely examined at the time of the first crop, a wide range of variation between the plants will usually be noticed. The most obvious difference may be that some plants have already matured fruit, while others have not flowered. If this cannot be attributed to having planted suckers of unequal development, then there is a high probability of early and late maturing strains being present.

Another variation is that some plants are sturdy and squat, and are already growing several low-set suckers in addition to the fruit. Others have no suckers, but instead have a dozen or more slips around the fruit—a "collar of slips," as it is called. Between these two types—a good type and a most undesirable type—there may be many grades.

Obviously the former plant is a profitable plant to grow, because it is a quick bearer and free-suckering, whereas the second type gives one good pine, but too often that is the first and last it will bear, since it has no suckers to bear subsequent crops.

Certain types of misshapen fruit are also hereditary, particularly "cripples" in Roughs. The sign of this is a thin, corky hairline throughout the length of the leaf.

Many variations will be found; some like the above are hereditary; others may be the result of variations in nutrition, but in general it is wise to propagate only desirable types and to reject all others. It is to labour the obvious to point out that the returns of a plantation are reduced by a proportion of unprofitable plants. The danger is that when the "collar of slips" type, for example, is present, and selection is not practised, a vicious circle sets in, since there is considerably more planting material available from this type than from the suckering type, and eventually the bad type predominates and ousts the good type.

At first growers must be content to make the main planting from good average suckers, discarding all definitely bad types. Then, if at thinning out after the first crop a selection is made from the finest plants, and these are planted separately, a pedigree stock will soon be built up.

Time of Planting.

From the purely horticultural aspect, time of planting is largely governed by suitable weather, both at the time of planting and for the few months immediately following. To plant during times of torrential rain risks having young plants washed out, buried in silt, or rotting. To plant during the months of low rainfall would result in plants being very slow in taking root, and the effects of the consequent setback may be visible during the whole life of the plantation. The most important period in the life of a plantation is the first few months after planting. The plants must be brought on quickly so that in as brief a period as possible they become large enough to shade the soil under them. This is touched upon under "Fertilizing" from a different angle. The point stressed here is that it is best to plant when the longest period of good growing weather to immediately follow can be anticipated, and if necessary to later adjust the time of cropping by the use of acetylene.

The following table gives the months of the year when on an average the rainfall exceeds evaporation, and, therefore, gives some guide as to suitable planting months for the different divisions. In planning ahead, however, reliance cannot be placed absolutely on getting the average rainfall. At Townsville, for instance, the average on seventy years is 45 inches, but actual figures range from 9 to 97 inches.

Cairns	From Dec. to April-May
Innisfail, Coast ..	„ Nov. to Sept.
Innisfail, further inland	„ Dec. to June
Cardwell	„ Dec. to May
Ingham	„ Dec. to April-May
Townsville	„ Jan. to March
Ayr	„ Jan. to March
Bowen	„ Jan. to March
Mackay	„ Dec. to June

A general recommendation would be to plant in the drier districts between the end of December and end of February, and in the wetter districts just after the period of heaviest rain, which would usually mean planting about April.

Cultivation.

The golden rule is to cultivate as lightly as circumstances will permit. To keep down weed growth and break the soil surface is sufficient. Deeper cultivation than this only breaks roots and results in the deeper drying of the soil. To deal with the luxuriant growth of weeds during the period of the summer rains may justify or necessitate greater disturbance of the soil, but since there is more moisture present not so much harm is done. The roots of plants maturing fruit, however, must not be broken. In particular, the time of transition between the period of the heavy summer rains and the dry months following is a critical one to plants maturing fruit, since their water requirements are high in order to continue to support the development of fruit, suckers, and growth produced during very favourable growing conditions. To damage their roots at this time gives them a severe setback. Nothing but the hoe should be used within a foot of them.

The aim should be to so utilise the means available—sucker-grading, time of planting, fertilizing, acetylene, and, if available, irrigation—that each section of the farm will be fruiting separately and in succession. This is quite attainable and makes operations much easier, since picking can be concentrated in a limited area. Fertilizer can be more efficiently applied to suit the growth status, and cultivation facilitated. For instance, in the case of plants maturing fruit one would withhold fertilizer until it was picked, and cultivation, if necessary, could be done with special care.

Fertilizing—Special Treatments.

Wartime restrictions on the use of the usual fertilizer ingredients require that modifications shall be made. However, in principle there still seems no better way to give fertilizer to established pineapples than by a water-soluble mixture placed in the leaf bases. Each plant receives a small quantity which gradually dissolves and becomes immediately available. By this method the fertilizer is not spread amongst the plants, as this has been proved to be less effective and to entail considerable waste. The rate of application is calculated at so much per thousand plants and not at so much per acre. On an average, one handful to four plants works out at 40 to 50 lb. per thousand, and one to six plants at about 30 lb. per thousand. If a few amounts are weighed out the rate of application can be checked and consistency quickly attained. The aim is to place the fertilizer exactly into the lowest leaf bases, and with a little practice it is possible to become expert in giving an equal dose to each plant.

The nutrition of such plants as pineapples has been the subject of much study. It is clear that the number of fruitlets is irrevocably determined by the nutrition of the plant up to the time the bud is formed at the growing point, which is some time before it actually appears. Thus, when the plant has been adequately nourished and the growth status good, there will be a large number of fruitlets and a large pineapple. Subsequent nutrition can only affect the development of the fruitlets. This explains why the pineapple produced by planting an over-large sucker is so small, since its nutrition was arrested and flower spike

formed before it could properly re-establish itself. Therefore, the importance of early fertilizing and the encouragement of strong early growth is evident.

Normally, the first application is given shortly after planting so as to encourage as quickly as possible a wide spreading leaf growth. Between 30 to 40 lb. per thousand is the usual amount. One or two further applications of 40 lb. per thousand will be necessary before the crop is picked. If planting has been done during the latter part of summer, a second application about May-June and another about September will be correct. Ratoon plants may be fertilized at approximately similar periods.

However, because of the shortage of the water-soluble mixture 10-6-10 at the time of writing, this programme may have to be varied. If a suitable organic type of fertilizer can be obtained it may be placed in the soil before planting, and the ration of 10-6-10 thus husbanded for later applications, or for older established plants. If organic fertilizer is used in ratoon fields it would be preferable to work it in among the plants shortly after the crop is off, as disturbance of the soil at this stage will cause least damage to the plants. However, it is for fertilizing established plants that the leaf-base method is so useful, and should be used if at all possible. When placing in the soil, and using 12 cwt. per acre as a basis, the rate per chain of row would be—double rows spaced 7 feet centres, 14 lb.; and single rows spaced 5 feet centres, 10 lb.

Leaf-base fertilizing depends for its effectiveness on adequate moisture either as heavy dew or showers to dissolve the fertilizer and carry it to the roots, thus the plant receives nutrient without root damage caused by soil disturbance. The reason why in the North the new methods did not meet with quite the same success as in the South, where they were developed, seems to be due to two factors: Firstly, not sufficiently realising the necessity of making full use of the comparatively brief period of summer rainfall when choosing the time to plant new areas; and, secondly, that rainfall during the latter part of the year is more often than not too light to maintain growth and give full effect to base-leaf fertilizing.

The remedy is irrigation, which, fortunately is usually available in the main pineapple areas. Spray irrigation is unquestionably the best, and remarkable control over growth and cropping can be attained by it. The amount of water needed is comparatively small, but having the means available to give the equivalent of a light shower when required enables crops to be obtained in quicker time. Furrow irrigation is useful, but not so effective as spray irrigation, and in any case requires a level surface. However, in the drier districts of the North irrigation in one form or another will greatly add to the success of commercial pineapple growing.

Acetylene gas will force plants into flower. Used with judgment and knowledge of local conditions, it is of considerable value to the pineapple grower. By a skilful manipulation of time of planting, acetylene, and fertilizer, the crop can be harvested at a predetermined time, and standover fruit can be eliminated by treating all plants which have not flowered with greater proportion of the crop. With irrigation in addition, even greater control can be established. For tropical conditions, the acetylene solution is prepared by dropping a lump of carbide as large as a hen's egg into a kerosene tin of water. As soon as

the effervescence has subsided it is ready. Approximately 2 oz. is poured into the heart of each plant. If rain falls within twenty-four hours of application, the result may be uncertain and the application should be repeated. This treatment has no adverse effect on the plant treated or its ratoons. The only proviso is that the plant shall be of sufficient development; otherwise the fruit will be small. As a general guide, it will take six or seven weeks from treatment to flowering for Smoothleafs and four to five weeks for Roughleafs, and sixteen to seventeen weeks from thence to picking.

When the soil is not sufficiently acid, sulphur will usually make it so. Some heavy soils will not respond to any reasonable amount of sulphur, but with sandy loams 3 to 4 cwt. per acre is generally sufficient. Advice should always be obtained before a soil is sulphured. Here it should be emphasised that the use of ordinary agricultural lime is, in general, harmful to pineapples.

In cases where sulphur cannot be used and it is obvious that pineapples are lacking iron, it will suffice to spray the plants with a weak solution of iron sulphate at the strength of 6 lb. to 25 gallons of water, this quantity being sufficient for one acre. A very fine mist jet should be used and only a light spray given.

Picking and Marketing.

Picking and handling a big crop requires good organisation to enable it to be done quickly and without damage to the fruit. Short rows and well-spaced tracks help a lot. A good packing place that can be kept clean and tidy speeds up work.

Colour by itself is not a true guide to maturity; climatic conditions render the colour of a mature pineapple very variable. Development of the fruitlets is more reliable, and should vary a little according to the distance of the market. Unless fruit is to be consumed at once, there is a definite advantage in cutting it instead of breaking it off the plant.

Fruit for market must look good as well as be good, and naturally every care is taken not to bruise it, to grade it well, and to pack it neatly in clean cases. A little woodwool is the best packing and looks well.

It is important also to pack the fruit when it is cool and to keep the packed cases as cool as possible during transit.

Diseases.

Pineapples in Queensland are little troubled with diseases and pests in the field. "Wilt" formerly was a serious trouble, but this has been almost entirely eliminated by a suitable acid reaction in the soil and adequate fertilizing. The few scattered cases of wilt in an otherwise healthy plantation are almost invariably due to planting a sucker which was too old.

Black Heart affects the fruit picked about May in North Queensland. This at present is believed to be due to cutting off the plants' water supply by too drastic cultivations at a time when it is maturing a fruit which was formed during the extremely favourable growing conditions of the summer rains.

Sunburn can cause the loss of much fruit. An effective preventive is either a paper sleeve or a tuft of woodwool placed on the fruit, particularly where it is exposed to the western sun.

The fruit rots which become noticeable in transit and in the market are due to organisms entering the fruit tissue through scratches or bruises, and the elimination of all sources of minor damage and clean hygienic conditions in packing operations will reduce them to a minimum.

These are the chief troubles met with; more detailed information on these and others can be obtained from the Department of Agriculture and Stock.

INFORMATIONAL AND ADVISORY SERVICES.

Information and advice on matters relating to primary production may be obtained from the Department of Agriculture and Stock, William Street, Brisbane, B. 7, or from appropriate officers in country centres. The following list shows where Departmental advisory officers are stationed:—

GENERAL AGRICULTURAL CROPS AND PASTURES: Brisbane (Tel. B 1541); Toowoomba; Chinchilla; Warwick; Laidley; Boonah; Kingaroy; Bundaberg (Court House); Monto; Rockhampton (cnr. Bolsover and Fitzroy Streets); Mackay (Court House); Ayr; Home Hill; South Johnstone (Bureau of Tropical Agriculture); Atherton; and Mareeba.

COTTON: Brisbane (Tel. B 1541); Dalby; Kingaroy; Gayndah (Court House); Monto; Biloela (Cotton Research Station); Home Hill; Ayr. All advisors on general agriculture also deal with cotton culture.

SUGAR-CANE: Brisbane (Tel. B 1541); Bundaberg (Sugar Experiment Station, Tel. 228); Mackay (Sugar Experiment Station, Te Kowai, Tel. 17); Innisfail (Tel. 271); Meringa (Sugar Experiment Station, Tel. Gordonvale 95); Cairns (Tel. 2589).

FRUIT AND VEGETABLES: Brisbane (Tel. B 1541); Coolangatta; Southport; Toowoomba; Warwick; Stanthorpe; Wallangarra; Dayboro; Nambour (Field Station, Tel. 175); Gympie; Gayndah (Court House); Rockhampton; Bowen; Townsville; and Cairns.

Advice on vegetable-growing is obtainable also from general agricultural advisory officers.

INSECT PESTS: Specialist Officers at Brisbane (Tel. B 1541); Gayndah (Court House); Rockhampton (cnr. Bolsover and Fitzroy Streets), Townsville.

PLANT DISEASES: Specialist Officers at Brisbane (Tel. B 1541) and Toowoomba (Long Street, Tel. 1990).

IDENTIFICATION OF PLANTS: Brisbane (Botanic Museum and Herbarium, Botanic Gardens, Tel. B 8243).

BEEKEEPING: Brisbane (Tel. B 1541).

SEED-TESTING: Brisbane (Tel. B 1541).

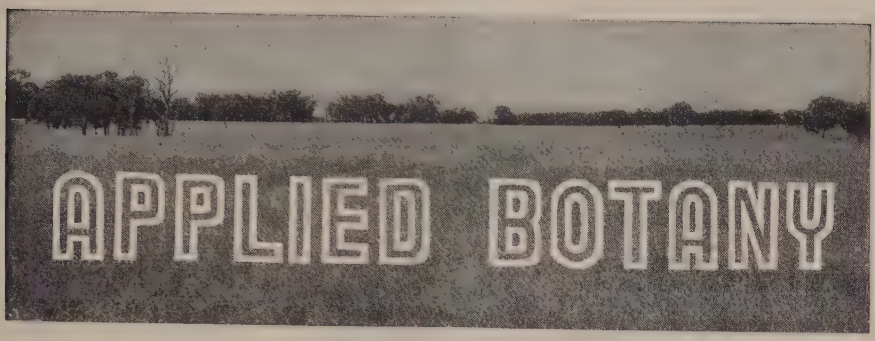
SHEEP AND WOOL: Brisbane (Tel. B 1541); Blackall.

DAIRYING AND CATTLE-RAISING: Officers of the Dairy and Stock Branches are stationed in a large number of country towns.

PIG-RAISING: Brisbane (Tel. B 1541).

POULTRY-RAISING: Brisbane (Tel. B 1541); Boonah (Stock Office).

VETERINARY SERVICES: Brisbane (Tel. B 1541); Yeerongpilly (Animal Health Station, Tel. JY 8005); Toowoomba (Tel. 547); Murgon; Rockhampton; Clermont; Townsville (Animal Health Station, Oonoonba, Tel. Townsville 484); Atherton.



Giant Sensitive Plant.*

A VERY SERIOUS WEED PEST IN NORTH QUEENSLAND.

C. T. WHITE.

ONE of the most widely spread weeds in North Queensland is the Common Sensitive Plant (*Mimosa pudica*), a low growing prickly weed on which there has been a good deal of controversy regarding its place in North Queensland agriculture. There is no doubt it is readily eaten by stock, and in its younger stages at least is highly nutritious. Recently, however, there has been introduced a more vigorous species, harsh and unpalatable in the extreme and one that may only be looked on as a most serious pest in the cane fields. Mr. H. G. Knust, Instructor in Cane Culture, recently wrote from Innisfail concerning this plant:—"This weed is causing some concern. It grows much more rapidly than the common Sensitive Plant and if allowed to grow in cane fields soon covers the mature cane and it is not possible to harvest any cane where the plant is established. The only local method used so far is for workers equipped with gloves to hand pull all plants they see, but this is a slow and expensive method. The plant if allowed to spread would become a menace on account of its thick growth and thorny nature."

The Giant Sensitive Plant is a native of Brazil and may be described as a shrub or shrub-like plant, the stems branching and sometimes, as in cane fields, inclined to scramble or climb over other plants. The stems are four-angled and the angles are clothed with sharp recurved prickles. The leaves are finely bipinnate, composed of numerous very small leaflets. The flowers are borne in heads and are similar to those of the ordinary Sensitive Plant. The pods are numerous and are borne in heads. They are about 1 inch long and $\frac{1}{4}$ inch broad, when ripe, and are clothed with small prickles. They later break up into 4-5 one-seeded sections.

This plant has a wide distribution through the West Indies, Mexico and Brazil. The accompanying illustration is from Martius' "Flora Brasiliensis." It is naturalised in Fiji and in a recent paper in the Journal of the Arnold Arboretum for July, 1944, W. R. Greenwood, a keen student of the Fijian flora, states that it appears to have become established in several places on the wet side of Viti Levu.

Undoubtedly this is one of the most serious plant pests that has been introduced into the cane fields of North Queensland and all farmers are advised to keep a sharp lookout for it, and to destroy it immediately it makes an appearance on their properties.

* *Mimosa invisa.*

Plate 96.
GIANT SENSITIVE PLANT OR SENSITIVE BRIAR.

Cretan Weed.*

C. T. WHITE.

CRETAN Weed is a small annual plant, a native of Southern Europe which has been naturalised in the Southern Sates for some years. Specimens have been received at odd times from the Darling Downs. This year, specimens were sent in by a correspondent at Clifton who states that the weed is appearing in patches here and there in cultivation.

Plate 97.
CRETAN WEED.

It may be described as a small procumbent or erect annual herb, the leaves rather rough to touch. The flowers are yellow and borne in heads. The seeds or achenes are about ¼ inch long and finely ribbed. They are of two distinct types; those of the outer series in the head are crowned with a small toothed cup, the inner ones with 4-5 scales ending in a fine point.

It is not known to possess any poisonous or harmful properties at any stage of its growth, but as it may become somewhat of a pest in cultivation because of its free-seeding qualities, farmers are advised to keep a lookout for it and eradicate it when it makes its appearance.

The accompanying illustration is taken from J. M. Black's "Flora of South Australia" and is an excellent representation of the plant.

* *Hedynotis cretica.*

ANSWERS.

(Selections from the outward mail of the Government Botanist.)

Tumbling Mustard.

J.A.R. (Augathella)—

Your specimen is from the Tumbling Mustard, which is a native of Europe and the Mediterranean Region. It is fairly common as a weed. It should be a wholesome plant, except that it would taint the milk of cows which eat it. Its botanical name is *Sisymbrium orientale*, and it belongs to the mustard and turnip family.

Prickly Poppy.

W.L. (Morven)—

The specimen is the Prickly Poppy (*Argemone mexicana*), a very widely spread weed in Queensland. It sometimes smothers large areas, particularly on alluvial flats. It is known under various names, such as California Thistle, Silver Thistle, and Silver Poppy. It belongs to the poppy and not to the thistle family.

The plant has been accused of poisoning stock at odd times, but has an intensely bitter flavour, and this and its prickly nature make it unpalatable. The only deaths recorded have been of poddy calves that had eaten the plants when cut, wilted, and softened a little.

Bracken Fern.

R.L.G. (Conondale)—

The full life cycle of Bracken Fern is from the spore stage up to the adult stage, which takes quite a long time, though the propagation of plants in a paddock is almost entirely from vegetative means—i.e., by spreading and division of the underground root system. Bracken is a pest not only in Australia but in all temperate countries and causes considerable trouble both in Europe and America. Very extensive trials regarding eradication have been carried out in England and Scotland, particularly the latter country, and K. W. Braid, of West of Scotland Agricultural College, has carried out very complete experiments. He mentioned in his report that the bulk of bracken rhizome may be enormous, 5 or even 10 or more feet of it lying below each square foot of surface. This is packed with food reserves such as sugar and starch. All these food reserves are manufactured in the fronds from carbon dioxide obtained from the atmosphere and from water containing mineral matter in solution from the soil. The removal of the fronds therefore (*a*) prevents the building up of further food supplies and (*b*) exhausts the underground reserves by inducing attempts to produce new fronds. Theoretically, and this is backed up by experiments, the best time to destroy fronds is when they have just reached their maximum growth—i.e., when they have drained the rhizome but have not begun to contribute food to it. In England and Scotland, this period is from the middle of June to early July. Here it would be, probably, from the middle of November to the end of December. It might even be a bit earlier according to the seasons, but anybody can watch this for himself. In Queensland, many farmers seem to think that better results are accomplished by knocking the fronds down with a stick, rather than cutting them off cleanly with a scythe or brush hook, but this is not thought to be very effective. Bullocks also have been found useful in keeping it under control, because they lie on it and crush the fronds. In a small patch, of course, the best thing is to keep the top foliage down so that the roots must eventually become exhausted. It means constant work for about three years.

Common Weeds Named.

S.H.C. (The Gums, Dalby)—

1. *Lepidium capitellatum*. This and other species of *Lepidium* are popularly known in Queensland as mustard weeds. They are excellent fodders, and stock eat them when they are drying off. They give, however, a rather offensive flavour to milk and cream.

2. *Brassica Sinapistrum*, Charlock. A common European weed naturalised in Queensland. It is one of the numerous members of the mustard and cabbage family known as mustard weed here. It is probably quite a good fodder, but would taint milk and cream badly.

3. *Bidens pilosa*, Cobblers' Pegs. Horses are very fond of the flowering and seeding heads of this plant.

4. Climbing Buckwheat (*Polygonum Convolvulus*). This plant is not a very common weed, but is sometimes seen in cultivation. It is not known to possess any poisonous properties, but where it is abundant stock are sometimes said to suffer from impaction through the fibrous twining stems.

5. *Gnaphalium purpureum*, Cudweed, a very common farm weed in Queensland. It has been reported that this plant, by its hairy fluffy nature, may cause impaction in stock. They do not seem to eat it to any extent, and it is not a particularly aggressive weed.

Mustard Weeds.

W.A.K. (Chinchilla)—

1. *Lepidium hyssopifolium*. This is the common Mustard Weed of the Downs, and is a native plant.

2. *Lepidium bonariense*. This is a comparatively recent introduction first noticed about ten years ago, and now it seems to be everywhere. It is a true mustard not a carrot, but because of the finely divided leaf many people call it carrot. Both taint milk and cream very badly.

PLANT PROTECTION

Predatory Insects.

J. HAROLD SMITH, Senior Research Officer.

FEW farm crops are free from attacks by insect pests and these, in their turn, seldom escape the attention of predators. Such natural enemies include birds, rodents and, probably most important of all, other insects. Some predatory insects, such as the ladybird beetles*, are well known but others are often present on the farm without being recognised as such; indeed, they are sometimes thought to be injurious to crops. It is therefore desirable that the farmer should be able to distinguish useful insects from those which are harmful. The examples discussed below belong to typical predatory groups of insects and it may accordingly be assumed that others with much the same general appearance will have similar habits.

1 2 3 4

Plate 98.

Hover Fly: Fig. 1.—Adult × 3; Fig. 2.—Egg × 12; Fig. 3.—Larva × 5; Fig. 4.—Pupa × 5.

[*Drawings by William Manley.*

Predatory Flies.

Most of the predatory hover flies (Plate 98; fig. 1) are brownish in colour, have a banded abdomen and vary in length from ¼ to ½ inch. They are often seen poised on the wing over flowering plants for relatively long periods and this habit gives them the common name—hover flies.† Their oval, dull-white eggs are laid singly among aphid colonies. From each egg (Plate 98; fig. 2) emerges a minute, slug-like larva with piercing and sucking mouth parts which are inserted into the aphid and through which the fluid contents of the body are removed.

* Ladybird beetles were discussed in this Journal, March, 1944.

† Two of the best known species in Queensland are *Xanthogramma grandicorne* Macq. and *Syrphus viridiceps* Macq.

Three moults take place during development and, at each, the skin is shed to permit expansion and growth. After seven to ten days of almost continuous feeding, the larva (Plate 98; fig. 3) changes to the pupa (Plate 98; fig. 4) which has a typical, tear-drop appearance. Like the larva, the pupa is found in and among aphid colonies on the plant.

A single larva of one of the predatory hover flies may destroy four or five hundred aphids before reaching maturity. As the female is very prolific—she may lay up to five hundred eggs—these insects can, under some conditions, bring an aphid outbreak under control in a very short time.

Plate 99. [*Drawing by William Manley.*
ROBBER FLY × 2.

Robber flies*, or soldier flies as they are sometimes called, are predatory on other insects in both adult and larval stages. They are relatively large insects (Plate 99), blackish-grey in colour, profusely clad with hairs and characterised by a tapering abdomen. The adults catch their prey on the wing but the immature larval stages feed on other insects in the soil. The eggs are laid singly or in small groups in the soil and from them emerge small but very active larvæ. These hunt their prey, which may be almost any kind of subterranean insect, though the white grubs which occur in sugar-cane crops and pastures are preferred. The early life of the larvae is necessarily precarious for suitable hosts may not easily be found. Those which do survive become less active but continue to feed and grow for at least one year and development may, in some species, extend to even three years. Transformation to the pupal stage takes place in the ground at the completion of larval development; the pupa typically has a series of stout spines at the front and sides of the head. Compared with the larva, the duration of the pupal stage is short and seldom exceeds three weeks.

*A very common species is *Promachus doddi* Ric.

Like many other predators, robber flies attack a wide range of insects, some of which are pests. They are sometimes a nuisance to apiarists as they may capture bees in considerable numbers near the hives.

1

2

[*Drawings by William Manley.*

Plate 100.

Predatory Lacewing: Fig. 1.—Adult Chrysopa × 5; Fig. 2.—Eggs of Chrysopa × 5.

Predatory Lacewings.

The predatory lacewings are very well known to citrus and other fruit growers whose trees are subject to attacks by scale insects, mealy bugs and aphids. There are both green and brown lacewings. Chrysopa,* one of the commonest green lacewings (Plate 100; fig. 1) is pale green in colour with long gauze-like wings held roof-wise over the body and extending far beyond it. It is about ½ inch in length and has long, many-segmented antennae. Citrus growers frequently see these insects on the ground when the tents have been removed from the trees after fumigation.

Green lacewings lay their eggs in groups of two to twenty, usually on the leaves of the trees. These eggs (Plate 100; fig. 2) are small and each is mounted on a fine thread-like stalk about ⅜ inch in length. On emerging from the egg, the larva climbs down the stalk and immediately begins to seek the scale insects, mealy bugs and aphids on which it feeds. These are torn to pieces by the sickle-shaped mouth parts which protrude in front of the head. After killing its prey, the body debris is worked backwards over the head and woven into a protective cover which increases in size until, prior to each moult, little of the actual larva can be seen. When full-grown, the larva pupates on the plant inside an oval,

* *Chrysopa innotata* Brau.

parchment-like cocoon. Towards the end of the pupal period, the lid of the cocoon is forced open by the pupa which then crawls outside before the adult lacewing emerges from it.

The brown lacewings have very similar habits to those of the green lacewings. All species are predatory and some have been used for pest control purposes in countries where pine forests are infested by the introduced chermes a small aphid-like insect which frequently becomes very numerous and destructive. Except for colour differences, the adults resemble the green lacewings. The eggs of the brown lacewings are, however, not stalked and the larvae never carry debris on their backs. The cocoons also differ from those of the green lacewings, being elliptical and loosely woven, not oval and parchment-like.

2 1 3

Plate 101.

PREDATORY BUGS: Fig. 1.—The Assassin Bug × 1½; Fig. 2.—The Asopid Bug, Oechalia × 5; Fig. 3.—The Mirid Bug, Cyrtorhinus × 10.

[*Drawings by William Manley.*

Predatory Bugs.

The majority of bugs are plant feeders but a few families have developed predatory habits. The common assassin bug* (Plate 101; fig. 1) is probably the best known species. It is about ¾ inch long, reddish-brown to yellowish-brown in colour, and has the wings folded within raised ledges at the sides of the abdomen. The mouth parts are formed into a beak which curves in a wide arc beneath the body. The brown, barrel-shaped eggs are laid in groups on the plant and from them emerge the nymphs which, apart from their smaller size and the absence of wings, are very similar in appearance to the parent. Each nymphal stage ends in a moult by which the skin is shed to permit growth. During both nymphal and adult stages, the assassin bug feeds on almost any other insect it can find in either the immature or adult stages. In all cases, the beak is inserted into the body and the fluid

* *Pristhesancus papuensis* Stal.

contents are removed. During outbreaks of caterpillar pests on vegetable and field crops, the assassin bug is commonly seen with a limp grub impaled on its beak.

Shield bugs are normally plant feeding in habit but at least one small group, the Asopids, is predatory. One species*, Oechalia (Plate 101; fig 2), is about ½ inch in length, with a rather ornate greenish-brown colour pattern which gives it a tesselated appearance. It has a dark, pointed spine at the lateral tips of the thorax. This bug usually attracts attention when caterpillar pests are active on vegetable and field crops.

A small Mirid bug† (Plate 101; fig. 3) destroys the eggs of a leaf hopper on sugar-cane and was transferred from Queensland to Hawaii some years ago to control the pest. It is usually found in the axils of the sugar-cane leaves where its leafhopper host sucks the juice from the plant. The bug is small, being only ⅛ inch long, and it is blackish in colour. Both adults and nymphs feed almost entirely on the eggs of the leafhopper which are pierced and sucked dry. The value of this predator is perhaps due to the fact that it prefers leafhopper eggs to other possible foods, that it seldom wanders far from the axils of the leaves where its host occurs and that its reproductive rate is much the same as that of its prey. Its whole life history is thus closely linked with that of the pest which it so effectively controls.

Predatory Ants and Wasps.

Some ants must be considered useful though their habit of nesting around the homestead sometimes makes them a domestic nuisance. Two of the best known are the small, brown, household ant‡ and the much larger, mound ant§. The former is an introduced insect which is now widely distributed in the coastal areas of the State. It lives underground and the workers emerge from several small nest openings and forage for scraps of animal refuse. Blow fly and house fly larvae are attacked when they leave the carrion or dung in which they breed and seek pupation sites in the ground. The adults, too, are destroyed shortly after they have emerged from the pupae and are still unable to fly. Heavy toll of these pests is taken when the ants are at all abundant and there can be little doubt that the fly problem would be much more serious in coastal areas if ant predators of this kind were less abundant. The mound ant, or meat ant as it is sometimes called, is a relatively large species whose nests underlie conspicuous mounds of soil measuring some feet across. Like the small household ant, it feeds principally on carrion and animal refuse but attacks on termite, or white ant, nests are one of the most conspicuous features of its activity. Should the wall of the nest or the several runways leading to it be breached by any mishap, mound ants quickly invade the galleries and remove the inmates to their own nest.

Predatory wasps are usually large, conspicuous insects which frequently attract attention in the field. Each species has a distinct preference for a particular type of victim and these may be flies, spiders, locusts, cockroaches or caterpillars. All are stout-bodied, brown or black insects, often with red or yellow markings. The antennae are many-

* *Oechalia consocialis* Boisd.
† *Cyrtorhinus mundulus* Bredd.
‡ *Pheidole megacephala* Fabr.
§ *Iridomyrmex detectus* Sm.

segmented and the sting comes from the tip of the abdomen and not from the underside as in parasitic species.

Most predatory wasps make some kind of nest in which the young are reared. These nests may be constructed from fragments of mud moulded into a cell, the location and type of which is more or less typical of the species, but those of some gregarious wasps* (Plate 102: fig. 1) are made from a parchment-like material containing fibres of various kinds. Some wasps sting their prey which then loses its power of movement. Often with considerable difficulty, the paralysed insect is carried back to the nest. In some species the nest is provisioned before the

[*Drawings by William Manley.*

Plate 102.

Predatory Wasps: Fig. 1.—The Paper Nest Wasp, Rhopalidia × 3; Fig. 2.—The Caterpiller Eating Wasp, Psammophila × 2; Fig. 3.—The Locust Eating Wasp, Chlorion × 2.

wasp lays its egg in it; in others, the larva of the wasp is supplied with food from day to day. In either case, the immature stages of the wasp develop at the expense of the prey brought to the cell by the parent insect. When full-grown the wasp larva pupates in the cell. From the pupa emerges the adult wasp which breaks through the cap of the cell and flies away to join its fellow predators in the field. Some wasps, particularly those living in communal, parchment-like nests, may feed the young on a specially prepared diet in which captured insects form an essential part.

The activities of wasp predators are conspicuous in the field for large numbers appear among growing crops when caterpillar and locust pests are active. Severe outbreaks of corn ear worm larvae in cotton and tomatoes attract large numbers of the redbanded Psammophila† (Plate 102; fig. 2), while small swarms of locusts and grasshoppers are not infrequently wiped out by the black and white Chlorion‡ (Plate 102; fig. 3).

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* *Rhopalidia gregaria* Sauss.

†*Psammophila suspiciosa* Sm.

‡ *Chlorion saevus* Sm.

2 1 3

Plate 103.

The Predatory Moth, Catoblemma: Fig. 1.—Adult Moth × 3; Fig. 2.—Larva × 3; Fig. 3.—Exposed Pupa in cocoon × 4.

[*Drawings by William Manley.*

Predatory Moths.

Though the soft-bodied larvae of the innumerable moths exhibit very diverse habits, only odd groups are mainly predatory on other insects. One of these is closely related to the cutworms and armyworms which are well known pests of cultivated crops. They belong to the genera Catoblemma, Eublemma and Thalpochares and they prey almost entirely on various kinds of scale insects. The common Catoblemma* (Plate 103; fig. 1) occurs in most citrus orchards, usually in association with the white louse scale which feeds on the trunks and limbs of the trees. When the larvae of this predator are at all numerous, the scale infested bark is covered with a great deal of webbing. The parent moth,

Plate 104.

The Predatory Moth, Bactrachedra × 7.

[*Drawing by William Manley.*

which is rarely seen on the wing, is about ½ inch in length and has the roof-shaped forewings coloured in soft, blue-grey shades. The eggs are laid singly among the scale insects and from each emerges a dull-coloured larva which spins a silken web for its protection. The protective webbing soon becomes cluttered up with the remains of the

* *Catoblemma dubia* Butl.

scale insects which have been destroyed. When full-fed, the larva (Plate 103; fig. 2) pupates within the shelter of the silken cover and later transforms to the adult moth.

Another group of moths also prey on mealy bugs, fluted and pouched scales. A typical species in this group is Bactrachedra* (Plate 104), a minute, greyish moth about ¼ inch long with fringed wings, the cream colour of which is broken by a single black spot on each forewing. Its greenish-yellow eggs are laid singly on or near the host insect and the inconspicuous larvæ which emerge from them burrow under the scale insects in the colony and attack them from below. Sometimes the larvæ of this predator are so numerous that two or three feed together under the one insect. Only a little silk is spun by this species and, without careful examination, its activity can only be detected by the presence of pellet-like debris surrounding dead and dying meal-covered insects which have lost their characteristic bloom. When full-grown, the larvæ pupate in silken cocoons from which the adult moths later emerge.

Plate 105.

PREDATORY BEETLES: Fig. 1.—The Ground Beetle, Calosoma × 1½; Fig. 2.—The Short-winged Beetle, Creophilus × 3; Fig. 3.—The Hydrophilid Beetle, Dactylosternum × 5.

[Drawings by William Manley.

Predatory Beetles.

Quite a number of beetles are predatory. The numerous, metallic-black, brown or green, ground beetles commonly found in decaying trash and rubbish are mostly beneficial. One of these, Calosoma† (Plate 105; fig. 1)—a large green insect—is not infrequently noticed during cutworm and armyworm outbreaks when it destroys large numbers of the caterpillars in quite spectacular fashion. Creophilus‡ (Plate 105; fig. 2), one of the short-winged beetles, is also commonly seen in the field, particularly when the corn ear worm is active. It has

* *Bactrachedra arenosella* Walk.

† *Calosoma schayeri* Erich.

‡ *Creophilus erythrocephalus* Fabr.

acquired the apt name, devil's coach horse, from its jet-black body and brilliant red head.

Several rather squat, glossy-black beetles are abundant in banana and pineapple plantations, particularly when cultural practices permit the accumulation of dead leaves, stems and other refuse. These beetles prey on other insects attracted to the same kind of environment and some have been distributed from one country to another to assist in the control of important pests. One of these, Dactylosternum* (Plate 105; fig. 3), a glossy-black beetle about $\frac{1}{4}$ inch in length, was introduced to Queensland from Malaya some years ago and released in banana plantations where the weevil borer was troublesome. It is now established in some coastal areas.

Fireflies are curious predatory beetles which are well known in the adult stage in both tropical and subtropical countries. The adults are soft-bodied, rather sombre-coloured insects about $\frac{1}{4}$ inch to $\frac{1}{2}$ inch in length and they usually fly at night. Both adult and larval stages are predatory though the latter alone are of any appreciable importance in this respect. Most of them attack snails and are equipped with a very poisonous sting which is almost immediately lethal to the host. Snails may be pests of field crops in irrigated or swampy ground but they are also intermediate hosts of some disease organisms which affect the health of farm animals. Fireflies have thus attracted some interest as a possible control for snails in both this and other countries.

The Importance of Predatory Insects.

The foregoing review of some predatory insects immediately prompts a query as to their value in controlling pests on the farm. The possibilities of using them for this purpose have, of course, been explored ever since biological control became a recognised method of attempting to limit the damage caused by insect pests. With one or two notable exceptions, predatory insects all possess certain disabilities. Among these disabilities is a frequent lack of precision in selecting their prey. Most predators feed on a variety of insects, and the pest species is seldom singled out for attack until it has become very numerous and is already injuring its host plant. A second disability in many predators is their relatively slow rate of reproduction. If a pest is to be kept under control, the predator must at all times be able to maintain itself in sufficient numbers to counter the sharp increases in the pest population which frequently take place. The more important predators are long-lived and reproduce at a relatively slow rate. Rapid increases in the pest population are therefore seldom followed immediately by a proportionately large increase in the numbers of the predator. The failure of a predatory insect to control the pest on which it feeds may also be due to a lack of selectivity in choosing its environment as compared with that shown by the host. Most insect pests have a distinct preference for certain parts of the plants which they attack and, unless the predator has almost identical preferences, it may fail to concentrate on the pest to the exclusion of other insects which occur elsewhere.

The few effective predators are therefore insects which feed on a single pest species or a group of related species, which reproduce at a rate sufficient to keep the proportion of predator to pest at steady values.

* *Dactylosternum hydrophylloides* Macl.

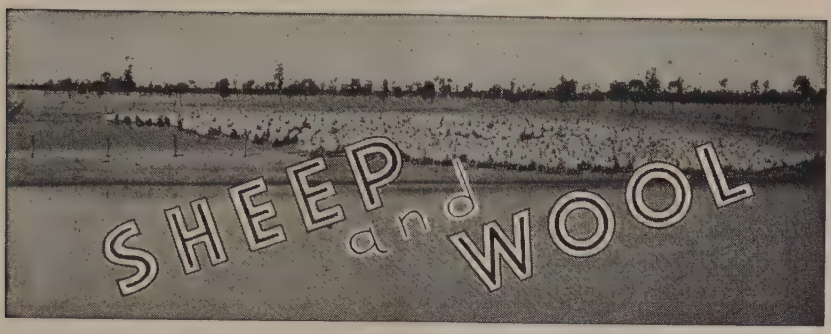
and which habitually prefer the same surroundings as their prey. Any predator which fails to meet these requirements cannot be continuously effective, though it may occasionally be useful. In some instances, it is possible to artificially increase the numbers of an insect predator to meet the requirements of an outbreak by breeding and liberating it on the farm. The procedure is only justified if the probable trend of the outbreak can be forecast with reasonable accuracy or, alternatively, if the cost of so boosting the predator population each year is negligible. Ladybird beetles have been used in this way in some countries where mealy bugs and scale insects are a limiting factor to fruit production.

The Influence of Predators on Pest Control Measures.

Not infrequently the farmer has to decide whether or no insecticides should be applied for the control of a pest when predatory insects are obviously active. Treatment may be unnecessary if past experience with these predators or groups of predators has shown that they are normally capable of eradicating the pest or at least bringing it under control within a few weeks. Thus, if mealy bugs or Pulvinaria scales are numerous on fruit trees and the mealy bug ladybird beetle* which feeds on them is common, sprays need not be applied for the control of the pest unless an immediate clean-up is imperative. Similarly, if the trunks of citrus trees are festooned with the webbing spun by the larvæ of the predatory moth, Catoblemma, it can reasonably be assumed that the white louse position will ease in the course of a few weeks. Treatment with the lime sulphur spray normally applied in late winter to control it would therefore be redundant. Again, if colonies of aphids appear on cotton or other field crops in pest proportions, the use of the usual nicotine sprays or dusts should only be necessary if ladybird beetles and hover fly larvæ are scarce and failure to control the aphids can, when judged from past experience, be expected to decrease yields.

Unless, however, the farmer is familiar with the significance of both predator and pest populations from long experience and close observation in the field, it is better to disregard the predators and apply the insecticide required to control the pest. Most of the contact sprays or dusts applied for the control of pests such as those cited above have little, if any, harmful effect on the predators, which should therefore survive and later exterminate whatever part of the pest population remains on the trees after treatment.

* *Cryptolaemus montrouzieri* Muls.



The Crossbred on the Farm.

J. L. HODGE.

IT has been amply demonstrated that farmers rearing a crop of lambs on farm lands in Queensland are considerably handicapped if recourse has to be had to merino ewes. To do well, merinos need space and plenty of it. Then again, they do not become domesticated as well as the crossbred, and quietness is a very desirable quality in a farmer's flock.

In advocating crossbreds for the farm, it is well to make plain what is meant is that the progeny should be from purebred stock on both sides. There is an opinion, prevalent amongst some farmers, too, that a crossbred of any sort will do. Nothing could be further from the truth. It is impossible to tell with certainty what the get will be from a line of ewes with a diversity of blood. Uniformity in a line of crossbred suckers is very desirable. "Like peas in a pod" should be the aim of the farmer. The crossbred mother, then, should be the progeny of a purebred sire from a purebred ewe.

There was a tendency, before crossbred wools improved in value, to regard the fleece from a fat lamb-raising flock as of secondary importance. This view should no longer be accepted, for well-bred crossbred fleeces are now very profitable.

The cross recommended for the farmer is got by using one of the long wools with the largest-framed, best-constitutioned merino ewe procurable. This merino ewe should be as free from wrinkles as it is possible to obtain. The ram recommended is the Border Leicester or the Romney Marsh.

All the ewes dropped as the result of this cross should be retained as the future breeders on the farm. There is a direct economic loss year after year, as the result of sending to slaughter ewe lambs so bred. It is admitted that prices for fat lambs have been very tempting, especially over the past twelve months, but in the interests of both the industry and the individual every effort should be made to reserve these crossbred ewes for the farm flock.

Stock-proof Paddocks Needed.

A disability with all British breeds and their crosses is their fence-forcing proclivities. It is necessary, therefore, that the fencing of the paddocks should be of the best, if the sheep are to be held securely on the areas intended for them. Rams of the Downs breeds, such as the Southdown and the Dorset Horn, should be joined with the crossbred

ewes described for the production of the fat lamb crop. All the resultant drop should be marketed as fat lambs. With adequate feeding, the lambs should be ready for market at from four to five months old, or even younger. As the crossbred ewe flock increases, it should be the object of the farmer to gradually eliminate the original merino ewes. Best prices will, of course, be realised if the ewes are fattened.

Breeding and Feeding.

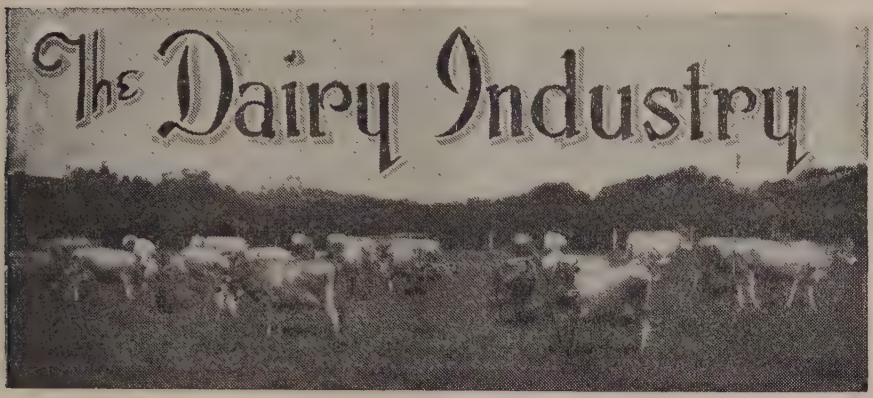
Some farmers contend that because the sheep in an average farmer's flock are comparatively few, it pays them better to buy crossbred ewes, rather than breed their own flock. There is much to be said in favour of this view, and one must be guided by individual circumstances. The drawback to the straightout purchase is two-fold, namely, the scarcity of the right type of ewe, and the high price one has to pay for it. The Corriedale should be well in the mind of the purchaser of a flock for fat-lamb raising. This general utility breed is fast gaining the favour of farmers, and rightly so. However, with it also the purchase price is likely to be high.

Feeding is of the first importance. Let it be understood at once that dependence on natural grasses, especially in small farm paddocks, can only lead to disappointment. It should be the object of the farmer to have his ewes dropping coincident with the growing crops. All the cereals are recommended. Increasing success is being obtained with grazing sorghums. Lucerne, than which there is nothing better, can be profitably grown on most farms in the fat-lamb areas. Lucerne may be regarded as costly to establish, but it should be remembered that, with care in grazing, the field should last for years. There is the old saying—"half the breeding goes down the neck." This is only half true, but if the farmer breeds right and feeds right, he should have no trouble in participating in the highly profitable prices now ruling, and likely to rule for some considerable time.

Some farmers make the mistake of running too large a flock for the farm. There is more to be made out of a flock of crossbred of lesser numbers, provided suitable ewes are chosen, than a large number of merino or nondescript types. There is wisdom in this maxim: carry only what can be adequately fed.

Marketing.

Farm lambs should be marketed as they grow to the necessary weights—33 lb., and truly fat, is a standard sucker weight. All the drop should not be held until the later dropped lambs are ready. To go the desired weight mentioned, a fat sucker lamb on the farm should scale about 60 lb. live weight. Under present conditions, heavier lambs are acceptable to the trade, and if feeding conditions are favourable, even up to 40 lb. dressed weight should be the objective.



Observations on the Non-stripping of Dairy Cows.

L. E. NICHOLS, Dairy Technologist.

THE urgent need for increased dairy production in Australia under war-time conditions, with its attendant man-power shortage, necessitates the adoption of any labour-saving device or practice which can be successfully applied or adopted. One practice which is steadily growing, and about which hitherto there has been much contention, is the non-stripping of machine-milked cows. In the course of the past two years observations have been made at several farms on the Darling Downs, firstly, on herds during a lactation period in which stripping after machine-milking was regularly followed; and, secondly, during a lactation period after stripping was discontinued.

Notable advances in recent years in studies on the physiology of milk secretion and milk ejection have shown that the old belief, viz., that non-stripping is detrimental, is actually without scientific foundation. Many farmers have also satisfied themselves by actual trial that stripping is not necessary after efficient machine-milking. This break from tradition was forced on them by existing labour difficulties.

The observations now recorded were made with a view to determining the effect of non-stripping on—

1. Milk and butterfat yields and average fat test of milk.
2. Incidence of milk abnormality due to udder troubles and on bacterial count of milk direct from the cow's udder.
3. Length of cow's milking period.

Effect of Non-Stripping on Production and Fat Test.

Six herds, aggregating 400 cows, of the A.I.S., Jersey, and Ayrshire breeds, came under observation. Seasonal conditions during the two lactation periods studied were reasonably comparable. It was the opinion of the dairy farmers concerned that stripping did not pay, as the decrease in production, if any, was slight, and the saving in labour appreciable. In a herd of 50 milking cows, at least one man's time in the milking shed can be saved, thus enabling more attention to be given to more productive farm work. Since adopting the practice, the owner of one of the herds, consisting of 64 cows, has been able to do the whole of the milking and dairy shed duties without assistance. With a four-unit milking plant he has managed the 64 cows, yielding up to 90 gallons of milk each milking, in two and a-half hours.

The average production per cow for the herds under observation was 182 lb. butterfat for the lactation period in which stripping was done, and 181 lb. butterfat in the succeeding lactation when stripping was not practised. The average fat test in both lactation periods was 3.9 per cent.

The table below gives the results of tests made during a milking on four farms to note the quantity of strippings and their effect on the fat test. For this purpose part of the herd was stripped, the remainder not stripped.

—	Average Weight of Milk Per Cow.	Average Butter at Test.
	Lb.	Per Cent.
Herd No. 1—Stripped cows	8·5	3·8
Herd No. 1—Non-stripped cows	8·0	3·8
Herd No. 2—Stripped cows	12·75	3·6
Herd No. 2—Non-stripped cows	12·5	3·6
Herd No. 3—Stripped cows	14·25	3·9
Herd No. 3—Non-stripped cows	13·5	3·8
Herd No. 4—Stripped cows	12·25	3·6
Herd No. 4—Non-stripped cows	11·5	3·6

In individual herds there was a decrease of 1 to 4 per cent. in total production for the full lactation period, during which non-stripping was practised, compared with the period during which stripping was practised. There was no significant difference in the average fat test.

Effect on Incidence of Milk Abnormalities and Bacterial Count.

Examinations were made in detail while stripping was being practised, and after its discontinuance, to observe the effect of non-stripping on the degree of udder troubles, as diagnosed by recognised milk tests. For this purpose, milk samples from individual quarters of the udder were subjected to the brom-thymol-blue test, leucocyte cell count on centrifuged samples, direct microscopic observation of stained smears and bacteriological plating. Of the six herds at the outset of the investigation, two were apparently entirely free from udder troubles; two had some cows with slight udder inflammations; while the incidence of udder trouble, though not serious, was of some concern in the remaining two herds. The second series of observations, made some time after stripping had ceased in the herds, revealed no increase in the normal bacterial flora of the udder, nor in apparent abnormality of the milk, as assessed by the tests applied. There was actually a tendency towards higher (though not significant) leucocyte cell counts in the milk of cows which were subjected to hand stripping. Likewise, there was no increase in the normal bacterial count of milk taken direct from the udder.

Effect of Non-Stripping on Length of Milking Period.

The comparative production figures already given confirm the fact that the lactation period is unaffected by the non-stripping of cows after machine milking. Almost all cows in the six herds gave a full lactation period of nine months, and many up to ten months. Many cows in these herds were, in fact, found difficult to "dry off" when stripping was not being done, even after the normal nine to ten

months' lactation period had elapsed. A few cows which dried off within six months, and a few which "let down" milk with difficulty, were culled. The dairymen were of the opinion that the culling of these cows was more profitable than to allow them to continue in the herd. As might be expected, the cows in these herds became easier to manage with non-stripping some little time after they had become accustomed to it. No difficulty was experienced in training heifers to these conditions.

Further Observations.

Efficiency of Milking Plant.—Milking machines of several types in common use in Queensland are in operation on farms on which these observations were made, and it is the opinion of each owner that, provided the machines are maintained in good mechanical order, satisfactory milking is assured without the necessity for hand-stripping of the cows. For successful operation in respect of non-stripping the farmers were all agreed that the machines should be operated at the proper vacuum (usually 13 inches), and correct rate of pulsation (45 per minute), that the teat cup inflations should be carefully watched to ensure they do not become slack, and that the teat cups must be removed from the cows as soon as they have milked out. Moreover, the teat cups which tend to work up the teats during milking should be drawn down again by gentle pressure after milking has proceeded about halfway through. Unless this is done many cows do not completely milk out without hand stripping. This step in the non-stripping procedure is regarded as most important.

Individuality of Cow.—The experience gained from observations of 400 cows of different breeds in six herds has shown that there are no practical difficulties in the way of non-stripping. The proportion of cows which do not respond favourably to non-stripping is very small. The results may not be considered by some farmers to be sufficiently conclusive because only six herds were under observation, but research here and elsewhere has shown that the animals suffer no ill effects from incomplete milking. Unsatisfactory animals may be culled, so that a uniform herd which can be milked out by machine without stripping may be built up. Moreover, even if non-tripping may not give entire satisfaction, there still remains the justification for its adoption in many herds as an aid to relieving teh existing man-power position.

Cows are creatures of habit and quickly become accustomed to a routine. In the environment of the milking shed, the stimulus to "let down" milk is relatively rapid. This stimulus is only temporary and does not occur more than once during each milking. It is therefore important that the cow should not be bailed up or that preparations for milking—such as feeding, udder washing, rejection of foremilk, and so on—should not be made until immediately before the operator is ready to milk her. Milking should then be promptly begun and continued as expeditiously as possible—normally four minutes for each cow is ample for machine milking. Cows which are disturbed by hastening into the cowyard and bails, or frightened by dogs and noise, may also show a tendency to "hold up" their milk. Cows should therefore be handled as carefully and quietly as possible in the cowyard and bails. Nervous cows or others known to react very readily to the stimulus to "let down" milk might be milked ahead of the rest of the herd. Similarly, cows found difficult to manage without hand stripping might also be milked first in order to facilitate the handling of the rest of the herd.

Summary.

Based on observations on six machine-milked dairy herds extending over lactation periods in which the cows were stripped in one lactation and not stripped in the succeeding lactation, the conclusions on non-stripping are:—

1. Stripping does not pay.
2. Production and fat test are not adversely affected.
3. An appreciable saving in time spent in the milking shed is effected.
4. Less man-power is needed.
5. The incidence of milk abnormalities due to udder troubles is not increased.
6. "Drying off" of cows is not accelerated.
7. A few individual cows may not prove amenable to the practice of non-stripping. These should be culled.
8. Heifers offer no difficulty when the non-stripping system is employed.
9. Efficient operation of the milking plant is necessary—in particular, care should be given to vacuum, pulsation, teat cup inflation, and the immediate removal of the cups after the cow is milked out.

RATIONING OF MILL AND ABATTOIR BY-PRODUCTS.

On and after 1st February, 1945, bran, pollard, blood, and meat and bone meals will be purchaseable only on presentation of a permit, issued by the Department of Agriculture and Stock, Brisbane. If possible, however, a quantity of bran and pollard may be made available through storekeepers for sale in lots of a bushel or less without a permit.

This action is taken under the *National Security* (*Agricultural Aids*) *Regulations*, and has become necessary because of acute shortage of these materials. It is imperative, therefore, that whatever supplies are available should be used to the best advantage in primary production.

Any farmer desiring to feed these meals to livestock should make application for a permit to purchase by completing form M.104, supplies of which are now available at all Branches of the Department of Agriculture and Stock throughout Queensland.

Applications close on December 21st and forms should be forwarded to the nearest officer of the Department of Agriculture and Stock, who is conversant with the livestock mentioned therein.

Before 21st December, 1944, sellers of bran and/or pollard in bushel lots or less should make application on form R.695, copies of which are being posted to all known sellers, for a permit to purchase a quantity of these mill by-products for resale.

Poultry keepers producing on a commercial basis and pig raisers will have first call on available supplies of blood, meat, meat and bone meals.

Dairy cattle supplying whole milk for human consumption, calves being reared on a whole milk supply farm, or on a farm where the milk output is being sent to a cheese factory, and poultry kept for commercial egg production will receive first preference with bran and pollard.

Two Types of Combination Milking and Feeding Facilities.

V. J. BRIMBLECOMBE.

BECAUSE of the importance of increased dairy production some form of feeding programme must be adopted to bring about this desired increase on most dairy farms. Lack of farm labour is one of the factors hindering such a scheme, and the plans submitted are offered as systems which will overcome, in some measure, labour shortage.

Plan No. 1.—Milking Shed and Feeding Facilities.

Plan No. 1 shows a combination of milking bails and feeding stalls, which can be adopted efficiently in conjunction with the crush type of Boyce's Patent type of bail. The plan can be arranged to suit up to ten or twelve cows on each side, if necessary.

The feeding troughs are each divided by a fixed partition into two sections, Part I. and Part II. In the centre of the partition a spindle is fitted, about which the troughs revolve, Part I. replacing Part II. by a a half turn of the feed boxes. The troughs are square except for the corners which are cut back so that they can revolve within a minimum of space between the sides of the troughs and the adjoining walls.

A rail track leading from the fodder reserve section of the shed is placed on either side of the bails, and a storage trolley large enough to hold sufficient fodder for a complete milking provided for each section of feeding troughs. Before the cows are brought into the bails for milking the necessary rations of fodder and concentrates are measured from the trolleys into, say, Part II. of the troughs and the troughs are then revolving half a turn to bring the fodder, &c., into position at the head of the bails. Part I. of the trough can also be provided with rations at the same time; thus there are two cows' rations ready in each trough before milking is commenced.

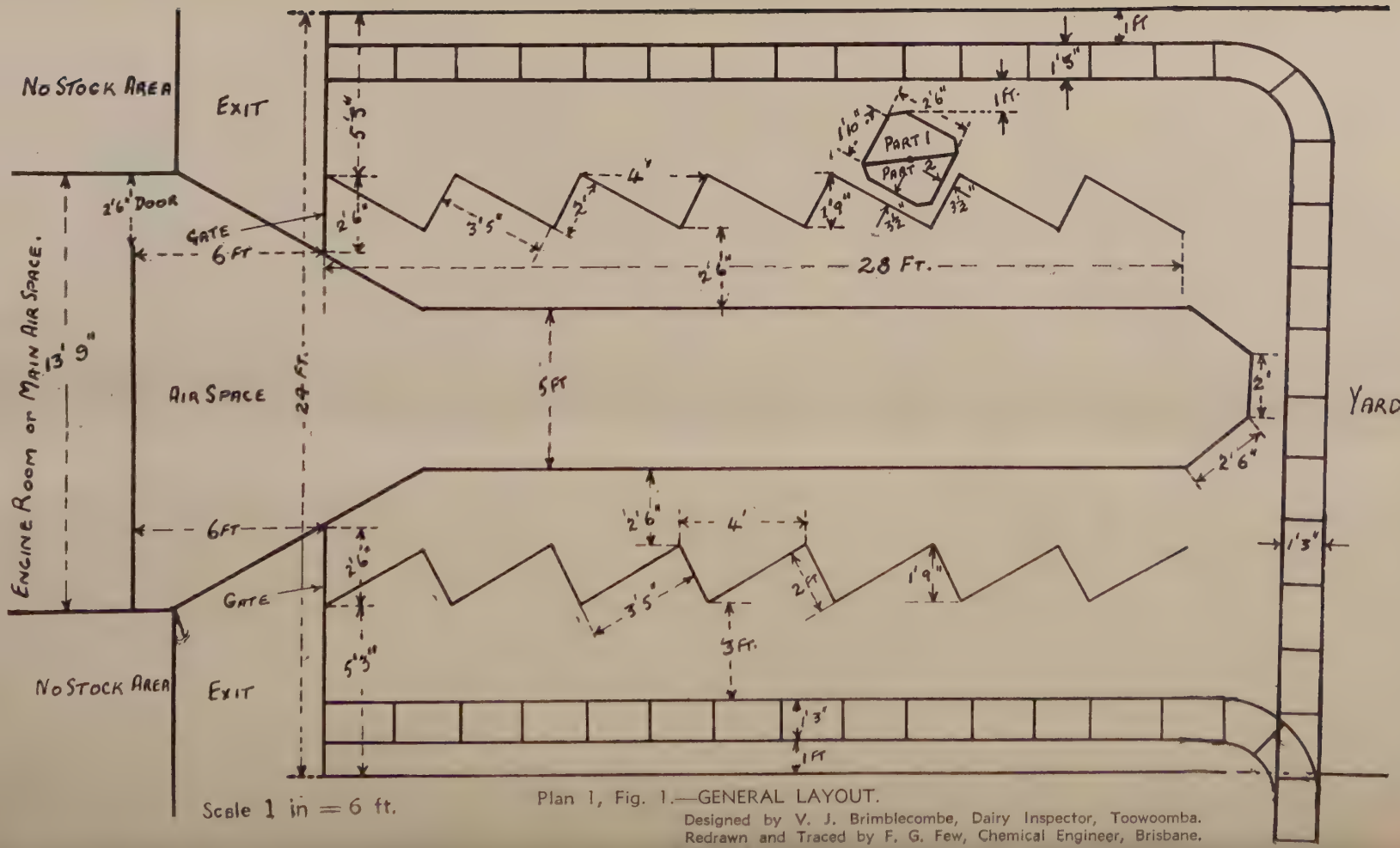
The first sections of cows are milked and fed; and when completed turned out through the exits. The troughs are revolved a half turn to bring the waiting rations into place before the next lot of cows. The empty parts of the troughs can then be filled for the third lot of cows and so the operation continues until milking is completed.

This plan would be more suitable for use in machine-milked herds than under hand-milking conditions.

Plan No. 2.—Plan of Self-Feeder for Protein Chaff and Concentrates at Front of Milking Bails.

The plan is designed primarily for the feeding of concentrates to cows being milked in "walk-through" shed designs, and is in the form of a self or automatic feeding arrangement at the head of the milking bails.

Under normal climatic and seasonal conditions on most dairy farms in Queensland there is usually enough bulky food (roughage) in the form of cultivated crops and grazing pastures to provide sufficient quantities of food to satisfy the appetites of most dairy cows. However, this bulky food is, except during the limited period of its maximum nutritive stage (that is, when not higher than 8 inches), lacking in the



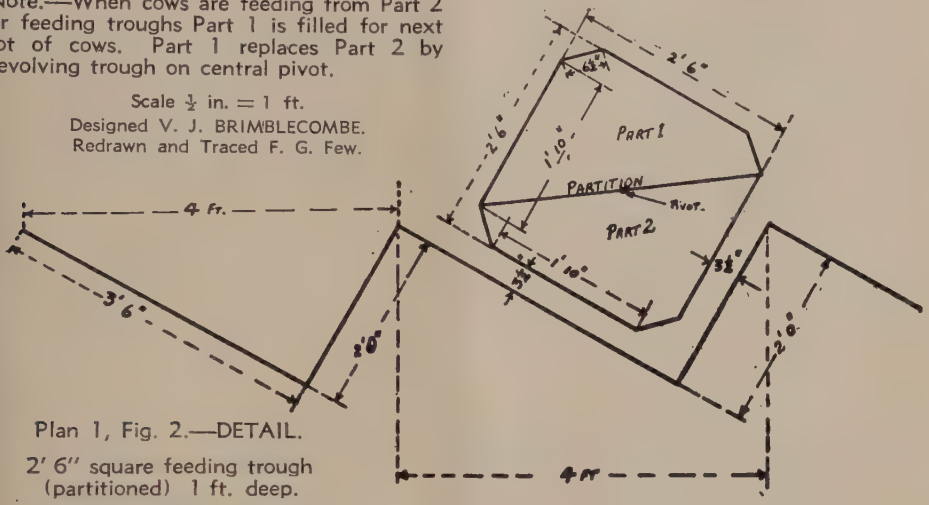
Plan 1, Fig. 1.—GENERAL LAYOUT.

Designed by V. J. Brimblecombe, Dairy Inspector, Toowoomba.
Redrawn and Traced by F. G. Few, Chemical Engineer, Brisbane.

Plate 106.

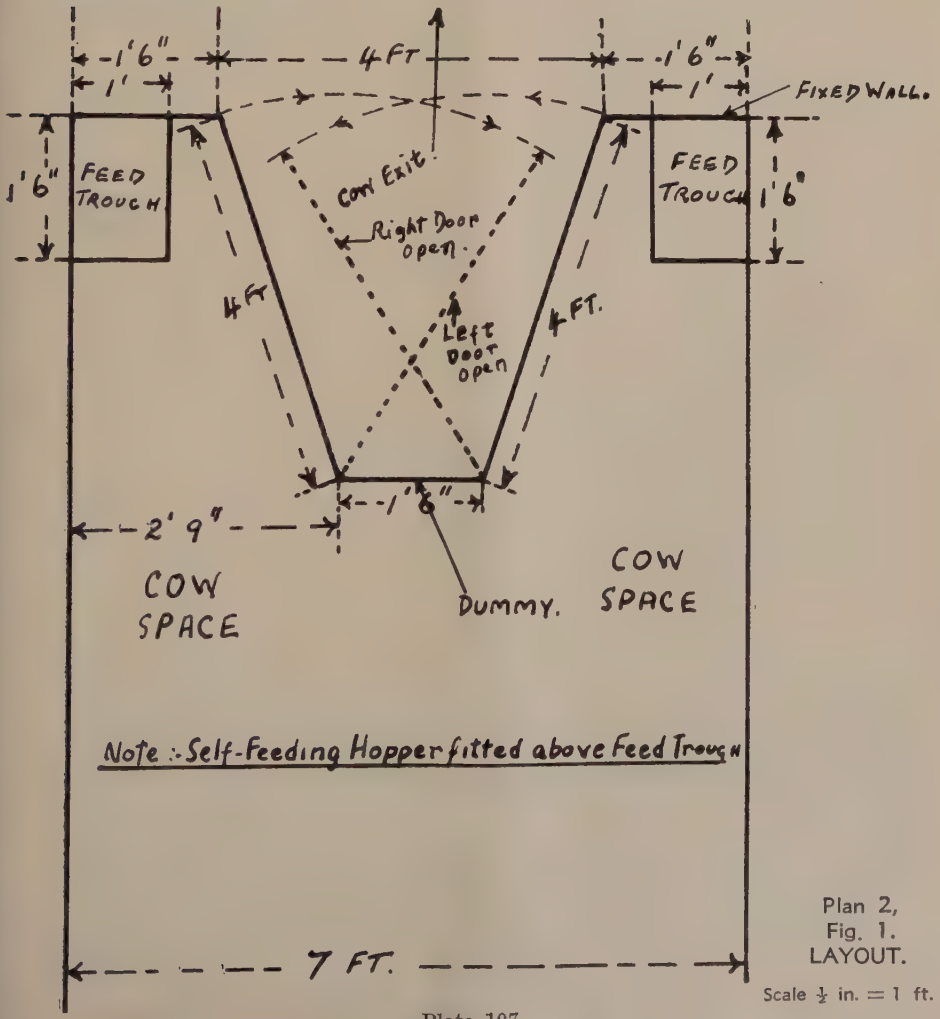
Note.—When cows are feeding from Part 2 or feeding troughs Part 1 is filled for next lot of cows. Part 1 replaces Part 2 by revolving trough on central pivot.

Scale ½ in. = 1 ft.
Designed V. J. BRIMBLECOMBE.
Redrawn and Traced F. G. Few.



Plan 1, Fig. 2.—DETAIL.

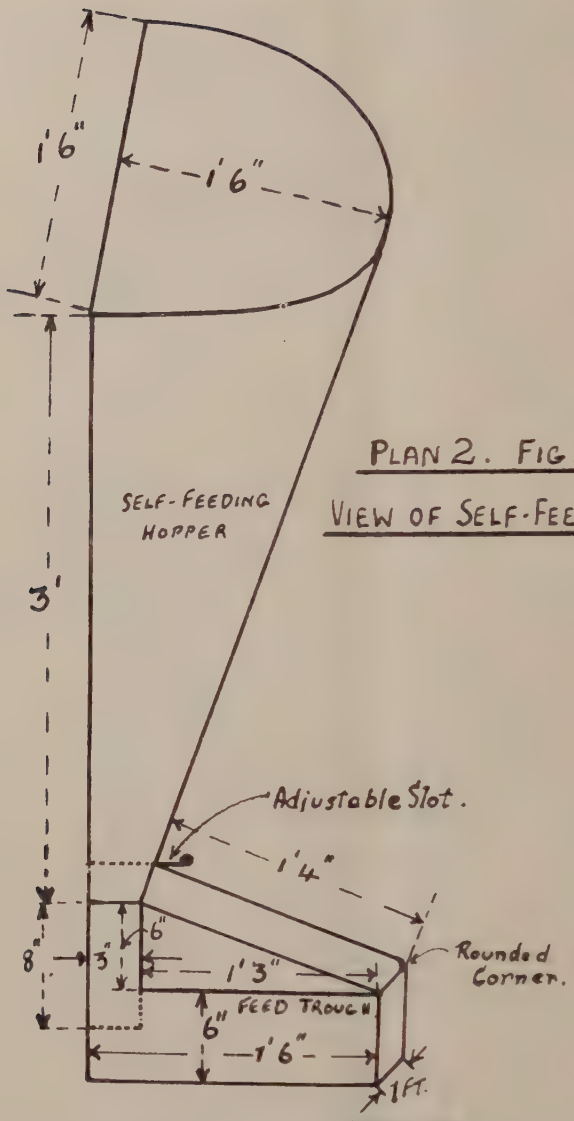
2' 6" square feeding trough (partitioned) 1 ft. deep.



Plan 2, Fig. 1. LAYOUT.

Scale ½ in. = 1 ft.

Plate 107.



PLAN 2. FIG 2.

VIEW OF SELF-FEEDING HOPPER.

Plate 108.

essential food requirements which make up a balanced ration so necessary for maximum milk production. To obtain maximum returns it is necessary, therefore, for the greater portion of the year, to supplement the forage and grazing fodders with mixed concentrates in the form of crushed grain and protein rich foods. This can be efficiently and conveniently carried out by the adoption of the self feeding arrangement as illustrated.

To obtain best results with this type of self feeder some modification will have to be made to the usual "walk through" type of bail. Instead of the cow walking straight through the front of the bail in the usual style, she will be diverted through the side of the dummy, and both cows in each unit will have a common exit in front of the

dummy. The head of the bail is constructed as a fixed wall attached to which is a rounded or oval type galvanised iron hopper which acts as a storage for the concentrate mixture. This hopper is tapered down to a feeding trough which is also attached to the wall at the head of the bail, preferably in the corners of the subdividing walls of each unit.

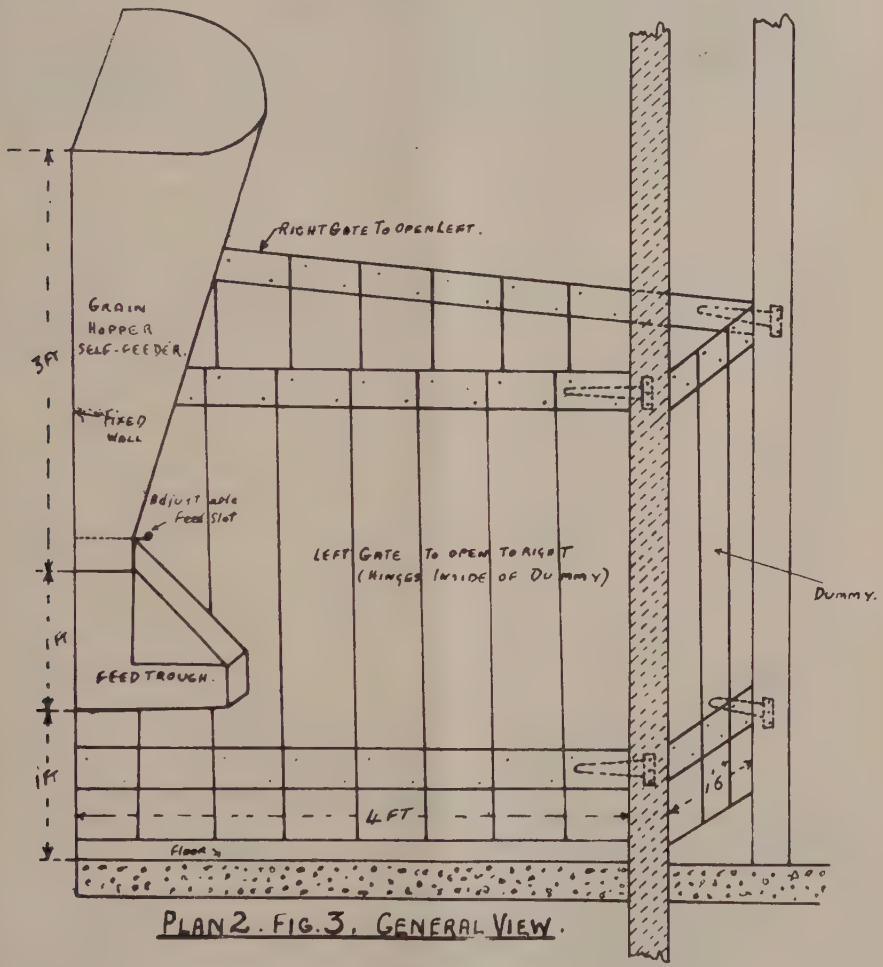


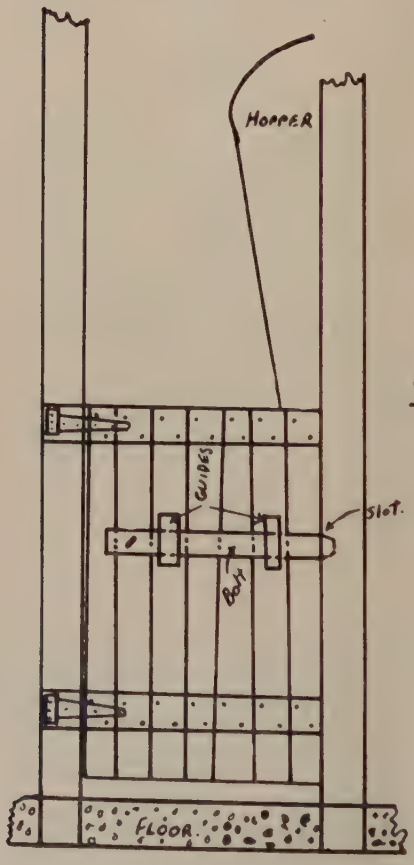
Plate 109.

The exit from the hopper to the trough is allowed to extend to within 4 to 6 inches of the bottom of the trough. Above the trough there is provided an adjustable slot arrangement to regulate the capacity of the flow of grain or other concentrates from the feeder; for example, some cows consume their food more quickly than others, or some low producers or nearly dry cows will not require the usual amount of grain and by pulling out or pushing in of this adjustable slot the supply of concentrates is regulated to these animals, and thus each cow receives approximately the amount of concentrate required in proportion to her production.

As stated, the feeding troughs are placed in the corners of the bails near the dividing walls and the corners of the trough protruding towards the cow space are rounded to prevent damage by the cows during their exit from the bails. Some concentrate mixtures may run from the self feeder more quickly than others and to prevent too rapid a flow a proportion of lucerne chaff may be mixed with the concentrates to retard the rate of delivery. However, it is considered that the regulator provided at the top of the trough will be all that is required.

This self feeding plan allows for the feeding of a large dairy herd with rich foods to supplement poor grazing, &c., with the minimum amount of labour for maximum returns at low cost. Some form of conveyor system which would be still more time and labour saving could no doubt also be arranged to facilitate the conveyance of the concentrates from the fodder reserve part of the shed to the self feeding hoppers.

By the feeding of concentrates in the right proportion as a supplement to pastures, &c., which are incapable of sustaining full yield the production of the majority of the dairy herds in Queensland could be increased by 30 per cent. to 40 per cent. This increase is urgently needed at the present time.



PLAN 2. FIG 4.

SHOWING WORKING OF LEFT GATE TO OPEN TO RIGHT.

Plate 110.

Coccidiosis of Poultry.

L. G. NEWTON.

COCCIDIOSIS is a disease of the intestinal tract, principally of young and growing stock. Adult birds usually act as "carriers"—*i.e.*, a few parasites are present in the bowel, but are of little consequence except when a bird's resistance is lowered and it suffers a mild, or, less frequently, an acute form of the disease.

Cause—The disease is caused by small parasites called "coccidia," which belong to the lowest form of animal life known as protozoa. These parasites are common to nearly all of the domestic animals and birds, but are markedly host-specific—*i.e.*, the coccidia of rabbits do not affect poultry and the various species which infest fowls do not attack ducks.

Six species are known to infest fowls the important ones of which are *Eimeria tenella* and *Eimeria necatrix*. *E. tenella* is the species responsible for "caecal coccidiosis." It sets up an acute infection, manifested by bloody diarrhoea and pus formation in the caeca or blind guts. *E. necatrix* invades the small bowel, usually being found in the first half of the intestine. It also produces severe haemorrhage.

A third species, *E. acervulina*, which also attacks the upper part of the small intestine, is usually associated with a chronic form of the disease, causing a thickening and furriness of the walls. This type is more common in older birds, while the former types set up acute disease among chickens.

Occurrence.—Coccidiosis occurs most commonly in chickens of 3 to 10 weeks of age, but early hatched birds may escape it entirely while at the end of the season they may be infested as early as within one week. This is, no doubt, due largely to the fact that at the beginning of the season the rearing pens are relatively free of coccidia as a result of cleaning or spelling after the previous season. With each successive batch of chickens, however, the floors become more heavily contaminated by frequent passage of the parasites until at the latter end of the season they are so numerous that the birds are infested as soon as they are placed in the brooder.

Life history of the parasite.—To understand the way in which the disease operates, it is essential to have some knowledge of the life cycle of the parasite. While the greater part of its life is spent in the intestine of the bird the parasite must undergo certain changes outside of the body for the completion of its life cycle. After reaching a certain stage of infection therefore, resistant forms known as "oocysts"

are passed out with the droppings. They have a thick protective covering which enables them to remain dormant in the soil for up to 18 months. Under suitable conditions, changes occur and the oocysts are capable of setting up infection when swallowed. The minimum period required for this process is from one to two days.

When swallowed, the protective covering is dissolved liberating several small parasites which have formed within. Each of these invades the wall of the bowel, and after further development gives rise to many new ones which enter other parts of the wall and repeat the process. The severity of the disease depends on activity of the parasites at this stage. Eventually some of them differentiate into male and female forms, which unite to produce oocysts which are passed out with the droppings as before.

Transmission.—The droppings of infected birds are heavily charged with oocysts, thus contaminating floors, feed hoppers and drinking vessels from which they are picked up by other chickens. Similarly, they are readily carried from pen to pen and farm to farm on the boots of attendants, crates and other fittings.

Symptoms and lesions.—With the caecal form, the lesions are confined to the caeca or blind guts. In severe cases, the chickens lose condition rapidly, become very pale and stand huddled with their feathers ruffled, their wings drooped and they chirp continually. The droppings may contain a considerable amount of blood, soiling the tail feathers and wing tips. With milder infections, there is listlessness, moping, paleness and ruffling of feathers. If closely examined, the droppings also show a brownish colour due to the presence of blood.

Severe outbreaks may involve losses of 50 per cent. or more, particularly among white leghorns, which appear to be more susceptible than other breeds. Deaths usually subside in one to two weeks, but the survivors remain carriers and many are stunted and anaemic and often develop leg weakness.

The lesions are confined to the caeca, which in severe cases are distended with blood the walls being almost completely eroded; in others, the walls may show haemorrhagic areas, while in mild cases, particularly at the end of an outbreak, a core of blood stained pus may be seen.

Intestinal coccidiosis.—This type is usually not as severe as the caecal form. There is a gradual loss of condition, and the birds become anaemic and listless. The droppings are slimy and moist, but blood is not often seen. Deaths are not as sudden as in the former type and occur over a course of some weeks.

If an examination is made after death, the lesions are found in the first half of the intestine, which is usually distended. When opened, erosion, thickening and considerable haemorrhage is seen. In some cases, numbers of greyish spots may be visible from the outside. These are "nests" of coccidia lying in the bowel wall.

Diagnosis.—Acute cases are easily diagnosed by examining the affected organs. Where there is any doubt three or four live chickens showing typical symptoms should be forwarded to the Animal Health Station, Yeerongpilly, for examination.

Control.

As no specific method of control is known, the aim should be to keep the birds as free as possible from infection until they build up a resistance. Since the parasite requires at least 24 hours outside of the host to become infective, cleaning out the pens once daily regularly will give good results. To facilitate cleaning, each unit should be of convenient size, *e.g.* 100 to 250 chickens, and light covering of litter will assist in drying out moisture and prevent the droppings sticking to the floor.

With the semi-intensive and free range systems of rearing, the ground in the vicinity of the houses becomes very heavily contaminated. This can be avoided by using moveable colony houses or "arks" which should be moved weekly.

The inclusion of milk or milk products in the ration has been found of considerable value. A mash made up of 40 per cent. milk, 10 per cent. bran and 50 per cent. maizemeal fed for a week helps recovery. Where fresh milk is available it may be allowed to sour and the chickens given as much as they will eat. Irrespective of what ration is fed, the feed hoppers should be so constructed that the chickens are prevented from putting their feet or from passing droppings into them.

Numerous forms of medicinal treatment have been prescribed—*e.g.*, feeding 5 per cent. sulphur, iodised milk, etc.—but their value is limited and if used should be combined with measures of hygiene and sanitation.

Plate 111.

A Dam on the Condamine River.—On Mr. Andy Reilly's property, Dalby District, Queensland.

Pig Feeding.

M. WHITE, Agricultural Chemist.

THE increased use of white grains, particularly wheat and sorghum, at the expense of maize, has introduced its own nutritional problems. The most readily observed of these is vitamin A deficiency in pigs, though the trouble is by no means confined to this class of livestock.

Brood sows fed a diet deficient in this vitamin not only produce litters with small reserves but nurse them on deficient milk. Mortality rate, under these conditions, is high, and, as the litter, at weaning, is transferred to a diet similar to that of the mother, there are continued losses.

The symptoms, at first, are somewhat vague. The farmer usually notices that the litter is not "doing well" and is subject to all the minor ills which affect young pigs. Pneumonia is common and death often supervenes. As the malady develops the more obvious symptoms appear, such as impaired vision, eye lesions with keratinous scales, continued restlessness and inability to control leg movement. Animals in the advanced stages are unable to "track" properly and eventually drag or skate the paralysed hind quarters. There is generally a marked swinging of the head as if the animals were observing the functionless legs. These symptoms follow nerve degeneration through bone pressure in the foramina. The optic, sciatic and femoral nerves together with parts of the spinal cord are most affected.

Treatment consists of supplying foods rich in vitamin A before the gross symptoms develop. Fish liver oils are excellent but supplies are limited. The simplest method the farmer can adopt is to include green feed or yellow vegetables in the ration. The price of maize and its scarcity preclude its use. It is too often forgotten that pigs are omnivorous and that one-third of the growing ration may be obtained from grazing. Dry sows may obtain two-thirds of their foodstuff in the form of green food during the first half of the gestation period.

By this system of feeding with brood sows the risk of sterility is obviated, the reserves of vitamin A for future use are built up and the young, both before and after birth, are assured of adequate protective vitamins so crucial in the first two months of their existence.

The second disorder which is becoming more marked since cheaper grain for feeding has outstripped supplies of skim milk and meat meal to balance the ration is lime deficiency. Restricted supplies of lime-rich foods together with increased allowances of cereals which contain the lime-robbing phytin has resulted in a marked drop in the calcium (lime) intake of pigs. The faster animals grow the greater the call for lime and if this demand is not met a well defined series of disorders occurs. Sows frequently farrow stillborn pigs. Those that are alive are unthrifty due to poor skeleton formation and to the fact that lime deficiency lowers milk production to such an extent that they are undernourished. Growth is retarded, and stunted, ill-shaped pigs with a habit of chewing all manner of foreign materials result. Bone fractures are common even at market weights when the lime requirements of the pig are not so insistent. The difficulty is largely overcome when grazing or ample legume hay is provided. It is adequately met when the source of protein for balancing is meat meal or separated milk. When these are in short supply a lime supplement is necessary. It may consist of powdered marble (limestone), sterilised bone meal (or burnt bone) or aged wood ashes—particularly from hard woods. Mixtures of any or all may be used. Even gypsum is a source of lime for pigs. Sows and growing, *i.e.*, not fattening pigs, should have first call on what is available. Up to one pound added to each 100 lbs. (dry weight) of food may be given or alternatively a mixture of equal parts sterilised bone, powdered limestone and wood ashes, with charcoal included, to which is added about 10 per cent. of salt may be kept in a heavy stout container where the animals have free access to it.

TO RID PIGGERIES OF FLEAS.

For ridding premises of fleas, a preparation which has proved successful is a mixture of 2 oz. of tobacco dust and 4 oz. of naphthalene, Sprinkle this around the pens, sties, and sheds once weekly. A useful insecticide spray for fleas and other pests, which may also be used as a household spray, is made up as follows:—One gallon of liquid ammonia, 4 lb. best white soap, 8 oz. of saltpetre, and 8 gallons of soft water. To make, chip the soap finely and pour the water over it, then boil until dissolved. Allow to become cold and then add saltpetre and stir until dissolved. Strain, let the suds settle, skim off the dry suds and add the ammonia, then bottle and cork. Another effective method is to heavily spray the sheds and sties with kerosene emulsion after thoroughly cleaning and ridding them of all accumulation of cobwebs, rubbish, dusty bedding, and other litter. Walls and floors should be sprayed and the spraying repeated two or three times.

If the pigs are infested, spray with the kerosene emulsion or wash them with a 3 per cent. solution of creolin and water, or any other standard creosote compound. Kerosene emulsion may be made according to the following formula: 1 lb. hard soap, 1 pint kerosene, 1 gallon of water. Boil the water, add the soap, and when it is dissolved remove from the fire and allow to cool slightly, then add the kerosene and stir well until emulsified.

—E.J.S.

FARM ECONOMICS

The Feed Grain Position in Queensland.

C. H. DEFRIES.

A REMARKABLE development in Queensland agriculture during the past few years is the steady increase in the aggregate area sown to feed grains. Feed grains include barley, oats, sorghum, maize, and wheat, but the increase in the total is largely the result of the rapid expansion in the production of oats for grain and the dwarf grain sorghums. The total area of these grains, excluding wheat, planted for feed in the 1943-44 season was 253,070 acres. This was an increase of 17,000 acres over the plantings for the previous season, and represents an increase of 44 per cent. over the average plantings for the three-year period, 1934-35-36. The yields of these crops showed an even greater increase in the 1943-44 season, but this was of course partly due to the favourable seasonal conditions then prevailing. The average yield of grain sorghum in the State, for instance, was 26 bushels per acre, as compared with the previous year's average of 18 bushels per acre. The total yield of grain was over 6,000,000 bushels as against 4·7 million bushels the previous year. Wheat is not included in these figures, but approximately 2½ million bushels are now being used annually by the poultry and pig industries. In the tables numbered 1 and 2 are set out the areas of feed barley, oats, maize, and grain sorghum planted each year, and the annual production of each of these crops during the past ten years.

The area sown to barley and oats declined considerably from 1939 to the 1941-42 season, although there has been a good recovery during the past two seasons. The acreage under oats has in fact increased considerably above normal. However, the decline in barley and oats was compensated for by an increase in the area of grain sorghums and maize in 1940-41. Since 1941, however, the area planted to maize has again fallen, and in the 1943-44 season was below normal plantings. The plantings of grain sorghum on the other hand have shown a steady upward trend. These fluctuations and trends of the areas sown to the four main feed grains are illustrated by the charts No. 1 to 4.

Great as the increased production has been, it should properly be considered in relation to the demand for the grain and the clear fact is that the demand for feed grains by the poultry and pig industries at the present time is growing at a much greater rate than the available supply. In other words, the numbers of pigs and poultry in Queensland have been increasing during the past few years at a rate greater than the production of the necessary feed grain supplies.

TABLE No. 1.

THE AREA OF FEED GRAINS IN QUEENSLAND FOR THE PERIOD, 1934–1944.*

Year.	Feed Barley.	Oats.	Sorghum.	Maize.	Total.
	Acres.	Acres.	Acres.	Acres.	Acres.
1934–35 ..	3,004	4,566	..	160,607	168,177
1935–36 ..	2,095	6,823	..	157,370	166,288
1936–37 ..	2,333	7,932	..	181,266	191,531
1937–38 ..	2,732	7,709	..	174,243	184,684
1938–39 ..	3,685	8,650	..	183,415	195,750
1939–40 ..	3,929	11,595	4,397	176,844	196,765
1940–41 ..	2,115	7,162	9,852	205,310	224,439
1941–42 ..	1,780	8,050	25,340	174,450	209,620
1942–43 ..	2,504*a*	19,103	40,630	173,816	236,053
1943–44 ..	3,562*a*	22,104	54,685	172,722	253,070

* Source: Government Statistician, Queensland.

a Six row barley, *i.e.*, Cape and Skinless.

TABLE No. 2.

PRODUCTION OF FEED GRAINS IN QUEENSLAND FOR THE PERIOD, 1934–1944.

Year.	Feed Barley.	Oats.	Sorghum.	Maize.	Total.
	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
1934–35 ..	45,016	82,198	..	4,142,079	4,269,293
1935–36 ..	26,475	119,459	..	3,504,000	3,649,934
1936–37 ..	10,076	22,417	..	3,149,000	3,181,493
1937–38 ..	36,423	79,323	..	2,628,458	2,744,204
1938–39 ..	62,004	93,128	..	3,733,424	3,888,556
1939–40 ..	66,880	199,766	62,074	3,344,853	3,673,573
1940–41 ..	34,459	75,984	207,834	4,444,474	4,762,751
1941–42 ..	23,620	66,770	387,840	3,987,970	4,466,200
1942–43 ..	58,426	92,248	742,872	3,798,072	4,691,618
1943–44 ..	69,555	129,692	1,428,292	4,511,754	6,139,293

CHART No. 1.—AREA SOWN BARLEY.

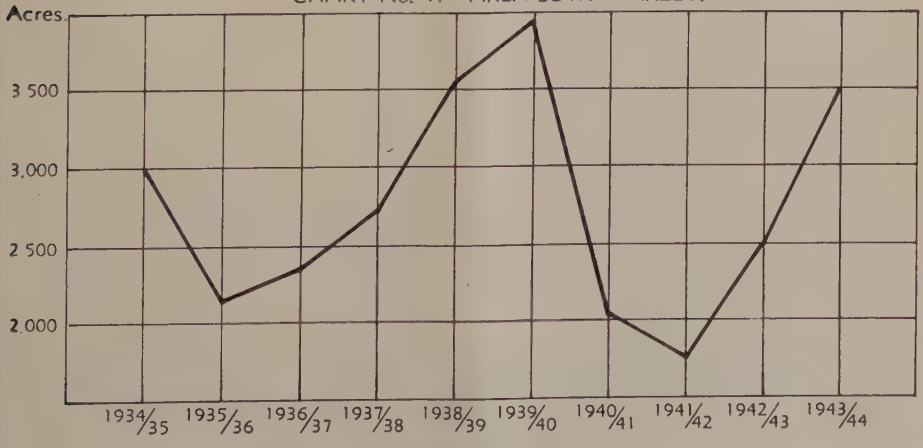


Plate 112.

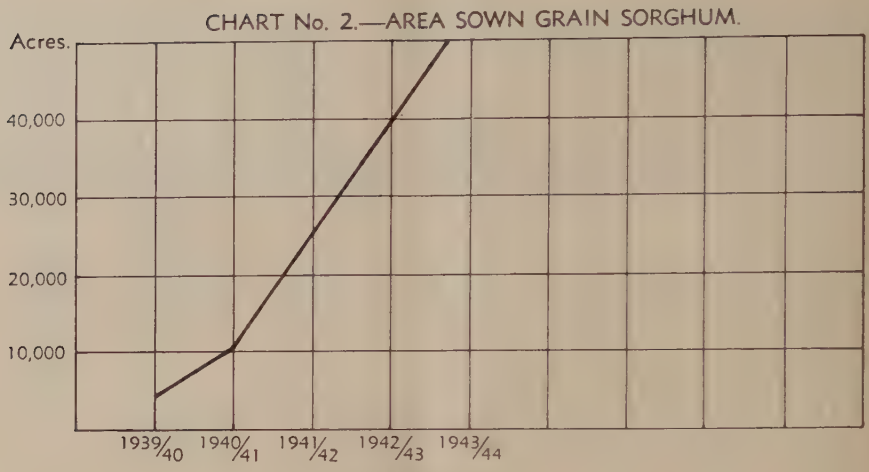


Plate 113.

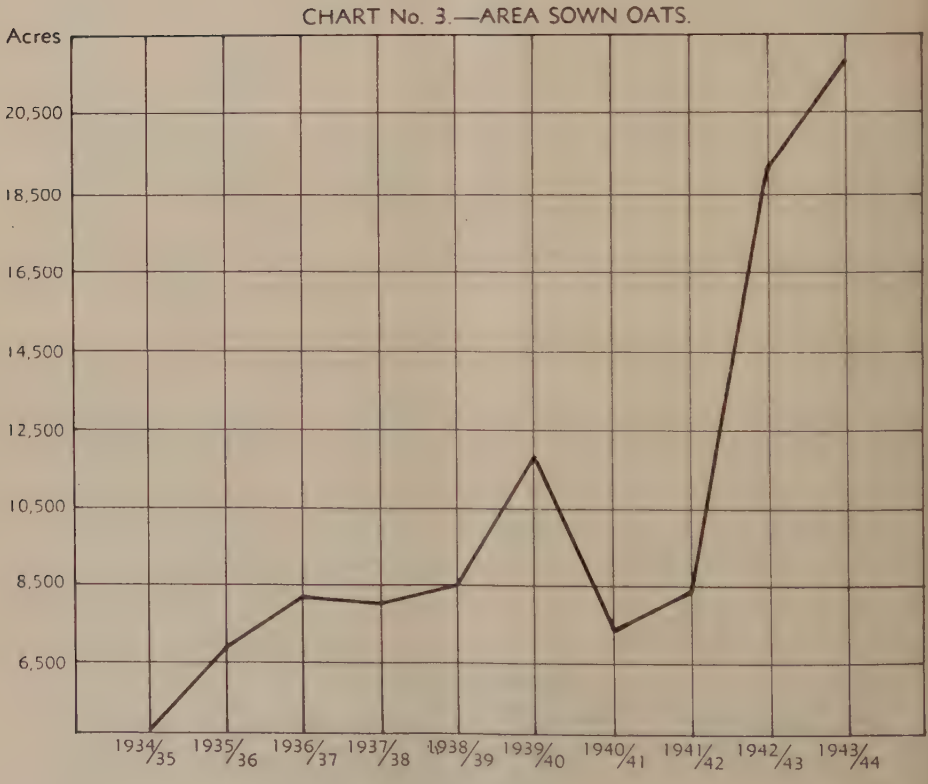


Plate 114.

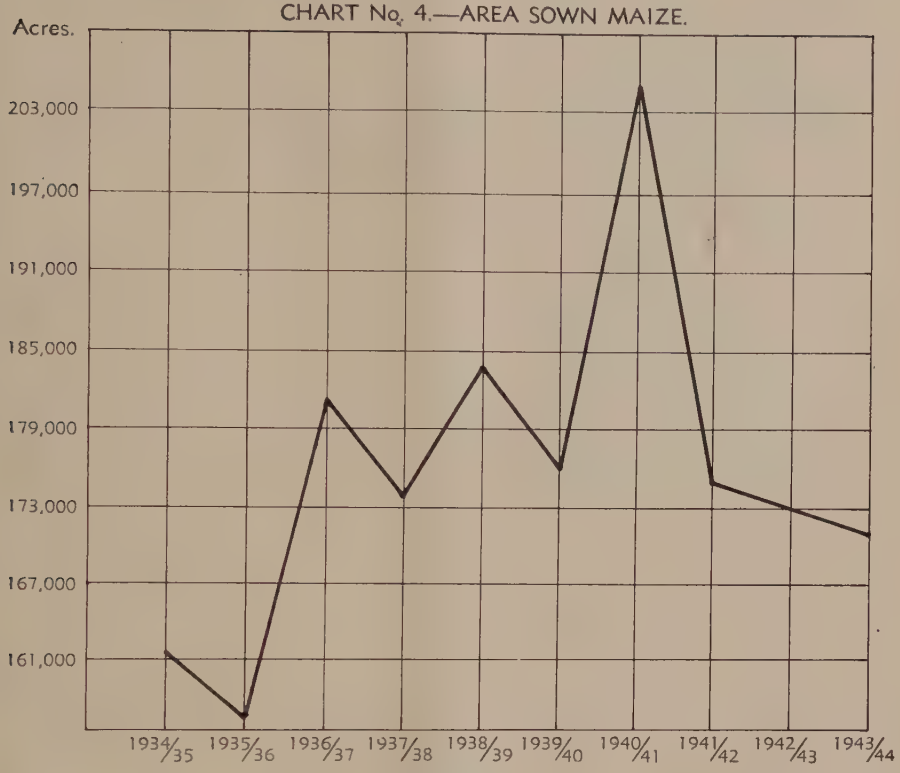


Plate 115.

The decline of the dairying industry and consequent diminishing supplies of skimmed milk for the feeding of pigs, combined with the increasing use of milk for cheese production has accentuated the shortage, but the failure of feed grain supplies to keep up with the pig and poultry population would have occurred in any case.

TABLE No. 3.

Pig and Poultry Numbers in Queensland, 1934–44.*

Year.	*Numbers of Pigs as at 31st Dec.	*Numbers of Poultry as at 31st Dec.	Indices for each Year Based on Average of 1934–35–36 = 100.		
			Pigs.	Poultry.	Area of Feed Grain Sown.
1934	269,873	1,227,000	94	100	..
1935	304,888	1,238,000	106	100	96
1936	290,855	*a*	104	..	95
1937	282,941	*a*	98	..	109
1938	325,326	*a*	113	..	105
1939	391,333	*a*	135	..	112
1940	435,946	1,382,507	151	112	112
1941	352,360	1,442,123	122	117	128
1942	434,458*b*	1,132,445*c*	147	92	120
1943	409,348*b*	1,840,029*d*	142	149	135
1944	450,391*b*	2,119,760*d*	156	172	144

* Source: Government Statistician, Queensland.

a Not available
b As at 31st March.
c As at 30th June.
d As at 31st March.

Table No. 3 shows the numbers of pigs and poultry in Queensland as at the 31st December of each year (except where otherwise stated) for the period 1934-44. In order to give some indication of the degree to which the population has increased, the three-year period, 1934-35-36, has been adopted as a base, and the percentage increase or decrease variation from the average population of this period is given in columns 3 and 4. An analysis on similar lines of the total area of feed grains planted is shown in column 5. The same base was chosen.

It will be seen that there has been a substantial increase both in poultry and pig stock numbers during the past ten years to the extent of at least 72 per cent. in the former, and 56 per cent. in the latter; this is a probable underestimation. The increase in the area of feed grains planted has been only 44 per cent. over the same period, and, of course, not all of this grain has been fed to pigs and poultry, some was required for industrial purposes and processing. This lag in the rate of increase of the total area of feed grains behind pig and poultry numbers is illustrated by the following chart.

CHART No. 5.

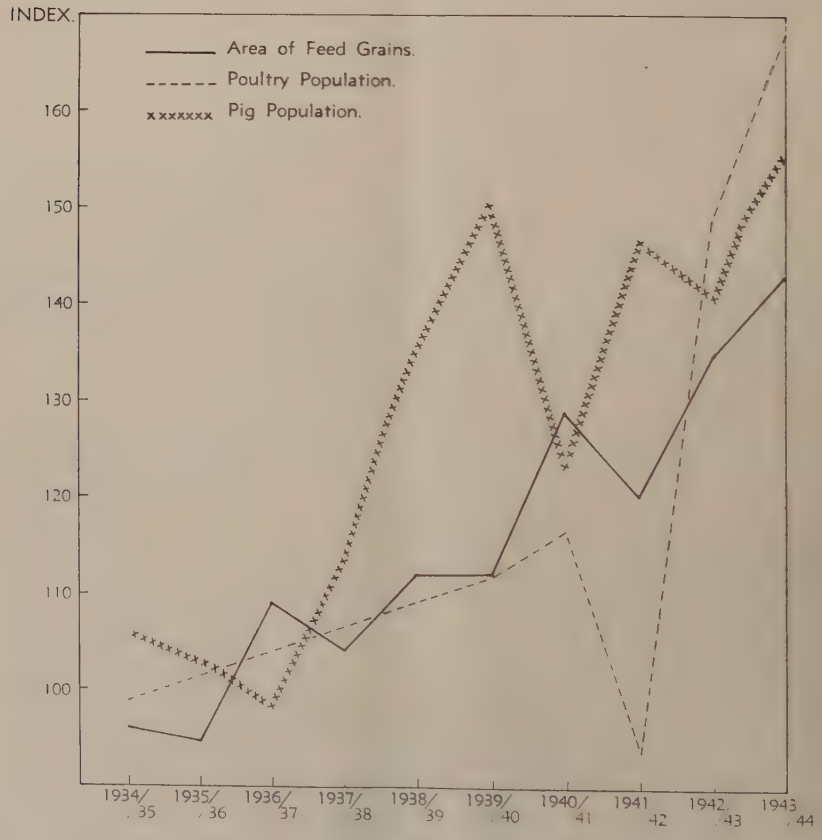


Plate 116.

ILLUSTRATING THE VARIATIONS OF NUMBERS OF PIGS AND POULTRY IN QUEENSLAND AND THE TOTAL AREAS SOWN TO FEED GRAINS FROM 1934 TO 1944.

Up to last season no great problem was involved, but if present trends continue, it is difficult to see how a serious position can be avoided. The production of feed grains last season shows a very gratifying rise, but this was the result of a particularly favourable season, and should there be no further increase in the areas sown or even if only a normal season is experienced a shortage is bound to occur.

This problem is not by any means confined to Queensland. It is present in other parts of the Commonwealth and other parts of the world. In the United States of America an acute shortage of feeding grains has developed. The Iowa Farm Economist* reports that the nation is using feed grain at record rates, and that animal numbers have caught up with the supplies. It is interesting to note that the conclusion reached in that country is that the nation's livestock industry has reached the end of the expansion of the last few years. This, of course, has particular reference to the cattle industry, as normally large quantities of feed grains are absorbed in this industry.

In normal times, the lag in feed grain supplies would be made up by the use of wheat either produced in Queensland or imported from other States. Every effort is being made to maintain supplies from the South, but transport difficulties cause uncertainties and irregularities in delivery.

The position therefore is not in doubt. Assistance from outside the State in the way of imported grain will be obtained only with difficulty, and the more Queensland is able to rely on its own production, the more secure will the position of the pig and poultry industries in this State become.

* Iowa Farm Economist, Volume X, No. 1-2, Page 3, January, 1944.

Plate 117.

A Combination of the Paddock and the Grazing System.—A disadvantage of this system is that the pigs tend to spend too much time eating maize and too little time grazing over succulent pasture; an hour or two of grain feeding daily is enough, and there should be plenty of clean drinking water for the pigs.

GADGETS AND WRINKLES

LAND AREAS.

MEASURE OF SURFACE.

484 square yards
10,000 square links } 1 square chain

10 square chains
4,840 square yards
100,000 square links } 1 acre
4 roods
160 perches

640 acres 1 square mile

MEASURE OF LENGTH.

7·92 inches = 1 link.

5½ yards
25 links } = 1 pole or rod

100 links
22 yards } = 1 chain
4 poles

8 furlongs
80 chains } = 1 mile
1,760 yards

A paddock 40 chains square would be

40 × 40 = 1,600 square chains.
1,600 ÷ 10 = 160 acres.

A paddock 70 chains long by 40 wide would be

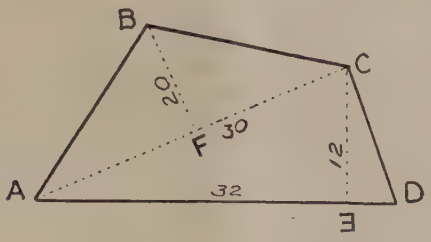
70 × 40 = 2,800 square chains.
2,800 ÷ 10 = 160 acres.

Rule.—Multiply length in chains by width in chains, and divide by 10 for acres. This applies only where all the fences are at right angles.

When paddocks are of irregular shape, they must be divided into triangles, the contents of each triangle ascertained, and their acreage added together.

As this paddock has no right angles, the rule on page 17 does not apply to it.

A line must be drawn across from corner to corner, dividing it into two triangles, thus:—



(The numbers in the figure are chains.)

Area of A B C D = area of A B C + A C D.

On the line A C draw the perpendicular line B F.

$$\text{Area of A B C} = \frac{\text{B F} \times \text{A C}}{2} = \frac{20 \times 30}{2} = 300.$$

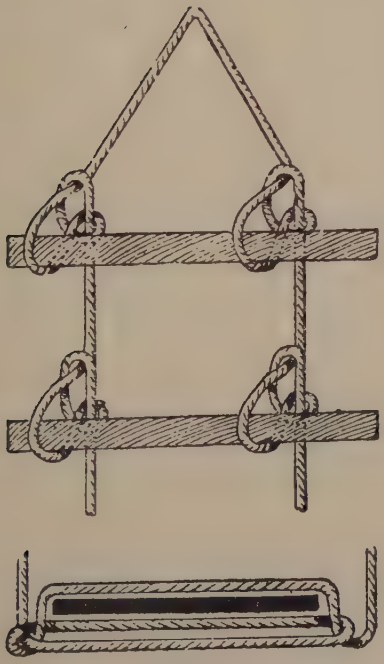
On the line A D draw the perpendicular C E

$$\text{Area of A C D} = \frac{\text{C E} \times \text{A D}}{2} = \frac{12 \times 32}{2} = 192$$

Total area = 300 + 192 = 492 square chains.

Divide by 10 to bring to acres.

= 49 acres 2 square chains or 49$\frac{1}{5}$ acres.



STRONG ROPE LADDER.

A ladder made on the simple principle, illustrated, has the advantage of being rigged in a few minutes and dismantled in as many seconds. Rungs may be of any material strong enough for the purpose, and are safer than pieces of timber with holes bored in them because unless the wood is very tough, it is likely to split. Hang, as shown, otherwise the knots will slip. Lower sketch shows the same knot used in providing a swinging scaffold, made from single plank with knot at each end.

Mother and Child.

Under this heading an article supplied by the Maternal and Child Welfare Service of the Department of Health and Home Affairs, dealing with the welfare and care of mother and child, is published each month.

CAN CHILDREN BE PROUD OF THEIR TEETH?

A DISCUSSION was overheard the other day between two young women who decided finally that the most important attributes to a good appearance are skin and teeth. In a previous article the care of the infant's skin was dealt with. The same care can be continued into adult life, and with the very important addition of the right kind of food a good complexion should be assured.

In these days, it is not uncommon to see children with nice complexions, but with bad teeth. At least half of the children attending the toddlers' health centres attached to this service have several teeth actually decayed, many more have badly formed and badly spaced teeth, and a perfect set of teeth in a child reaching school age is unfortunately a rarity.

Teeth should be beautiful structures—they should enhance the appearance, prove satisfactory tools for chewing the food and last a lifetime. If the teeth are ugly—misshapen, decayed or overcrowded—someone has been at fault, and amongst the things which mothers and fathers should study in a programme for healthy living is the story of the teeth.

We have two sets of teeth, the baby or milk teeth—twenty in all, and the second or permanent teeth—thirty-two in all. Teeth are divided up into different types. There are the front teeth or incisors which are for biting, the eye teeth or canines which are the tearing teeth, the teeth behind the canines called bicuspids which both tear and crush, and finally the molars or grinders. Each of these teeth should bite against the corresponding tooth in the opposite jaw. If they do not, it is impossible to chew properly and the teeth and gums may suffer injury. Every tooth has a particular job to do, and when one has gone the whole of the teeth on that side become inefficient. If the teeth cannot do their work, the food will be swallowed in large pieces and chronic indigestion may result. A child needs correctly placed teeth in order to speak plainly, as the teeth are used in articulating certain words.

If the teeth are decayed, the entire health of the body can be affected, sometimes seriously, as it is now known that diseased teeth provide entrance for germs into the bodily system. Abscesses at roots of teeth drain into the blood vessels, and the poison from them goes with the blood into every part of the body; if this continues, the general health is obviously affected.

In next month's article parents will be told how to care for these very important structures, so that their children will not suffer because of their lack of knowledge. In the meantime, questions on this or any other subject concerning maternal and child welfare will be answered by communicating personally with the *Maternal and Child Welfare Information Bureau*, 184 St. Paul's terrace, Brisbane, or by addressing letters "*Baby Clinic, Brisbane.*" These letters need not be stamped.

IN THE FARM KITCHEN.

For Dinner.

Meat Roly Poly.

Take 4 oz. shredded suet, ½ lb. liver or cold meat, 1 onion, 1 cup water, ½ lb. flour, ½ teaspoon salt, 1 cup gravy or stock.

Chop the liver or meat and onion. Mix with flour, shredded suet, and salt. Moisten with the water to make a fairly stiff paste, roll lightly and shape into a roll. Lay roll on a scalded and floured pudding cloth. Roll up in cloth and secure ends tightly. Place in a saucepan of boiling water and boil for two hours. When cooked, remove cloth and serve with the gravy or rich stock heated and poured over. Enough for two or three persons.

Turnip and Marrow.

One lb. grated turnip, marrow slices, 1 onion, 1 oz. dripping, seasoning, 1 small cup milk.

Mince the onion and brown in the dripping for a few minutes. Then add the grated turnip, a few slices of marrow, and the seasoning, and pour over these the cup of milk. Cook gently for three-quarters of an hour.

Baked Rhubard Pudding.

Stew 1 bunch rhubarb in the usual way, using as little water as possible. Remove the crust from stale white bread and weigh 1 lb. Cover this with just enough milk and when quite soft squeeze out until almost dry. Mix this with 2 oz. finely-grated suet, 2 oz. sugar, and 1 beaten egg. Line a well-greased round cake tin with this mixture, reserving enough for top. Fill with rhubarb, then cover with the remaining bread mixture. Bake in a moderate oven for 1½ hours. Turn out carefully and serve hot.

Baked Stuffing with Meat.

Boil five or six onions, add 2 cups breadcrumbs, tablespoon dripping, 1 egg, salt and pepper.

Savoury Cutlets.

One breakfast cup of mashed potatoes, 1 breakfast cup of mixed cooked vegetables, such as peas, beans or carrots, 1 cup fine stale breadcrumbs, ½ teaspoon chopped parsley, ¼ teaspoon powdered mixed herbs, 1 egg, 3 teaspoons meat extract, salt and pepper, crisp baked brown breadcrumbs for coating, fat for frying.

Chop the mixed vegetables and stir into the mashed potatoes together with the parsley, mixed herbs, breadcrumbs, meat extract, egg, and salt and pepper to season. From the mixture form nine cutlet shapes, coat with browned crumbs and fry in hot fat for a few minutes on each side. Stand on a wire tray to drain.

Potato and Cheese Pie.

Take 3 cups mashed potato, 2 eggs, ½ cup milk, 4 oz. grated cheese, 1 tablespoon finely chopped parsley, salt and pepper. Separate the eggs. Beat yolks and add them with the milk, cheese and parsley to the potato seasoned with salt and pepper and beat all together. Whip the whites to a stiff froth and fold into the mixture. Bake in piedish for 30 minutes in a good oven.

Little Coconut Pudding.

Cream 2 oz. butter with 2 oz. sugar, then add 1 well-beaten egg and ½ cup milk. Stir in 3 oz. grated coconut and 3 oz. breadcrumbs, adding lastly ½ teaspoon baking powder. Half fill a greased piedish or separate moulds and bake 30 minutes in a moderate oven. Serve with custard.

Cheeswick Pudding.

Take 2 cups flour, 1 cup sugar, 2 large tablespoons dripping or butter, 1 cup fruit (currants, raisins and peel).

Rub butter into flour, then add sugar and fruit, 1 teaspoon carb. soda dissolved in 1 cup milk. Steam for 2 hours. Serve with sweet sauce.

Brown Pudding.

Take 1 tablespoon each of butter, sugar, and jam, 2 eggs, ½ cup milk.

Mix well together, then add 1 cup flour sifted with 1 teaspoon carb. soda. Boil for 2 hours in a mould.

Devonshire Potato Cakes.

Rub 3 oz. of good dripping into 4 oz. of flour, and then add 10 oz. of mashed boiled potatoes, 1 oz. of sugar, 1 oz. of currants or sultanas, a pinch of salt, and half a beaten egg. Mix well together, roll out about ½ in. thick, and cut into rounds. Then either bake in a hot oven or fry in a heavy frying pan. Serve hot.

ASTRONOMICAL DATA FOR QUEENSLAND.

DECEMBER.

TIMES OF SUNRISE AND SUNSET.

At Brisbane.			CORRECTION IN MINUTES FOR OTHER PLACES.					
Date.	Rise.	Set.	Place.	Rise.	Set.	Place.	Rise.	Set.
	a.m.	p.m.						
1	4·45	6·28	Cairns	+ 50	+ 8	Longreach ..	+ 44	+ 26
6	4.46	6.32	Charleville ..	+ 29	+ 25	Quilpie	+ 33	+ 37
11	4.47	6.35	Cloncurry ..	+ 64	+ 36	Rockhampton ..	+ 19	+ 1
16	4.49	6.38	Cunnamulla ..	+ 28	+ 30	Roma	+ 19	+ 15
21	4.51	6.41	Dirranbandi ..	+ 17	+ 21	Townsville.. ..	+ 42	+ 8
26	4.54	6.43	Emerald	+ 28	+ 11	Winton	+ 51	+ 29
31	4.56	6.46	Hughenden ..	+ 48	+ 22	Warwick	+ 3	+ 5

TIMES OF MOONRISE AND MOONSET.

At Brisbane.		
Date.	Rise.	Set.
	p.m.	a.m.
1	7.41	5.36
2	8.40	6.29
3	9.33	7.24
4	10.21	8.21
5	11.03	9.17
6	11·41	10.12
7	..	11.06
	a.m.	
8	12.16	11·58
		p.m.
9	12.48	12.49
10	1.20	1.40
11	1·51	2.32
12	2·24	3.25
13	2.59	4.20
14	3.37	5.17
15	4.20	6.15
16	5.08	7.13
17	6·01	8.10
18	6.58	9.03
19	8·00	9.53
20	9.02	10.38
21	9.06	11.20
22	11.08	11.59
	p.m.	
23	12.11	..
		a.m.
24	1.14	12.38
25	2·17	1.17
26	3·20	1.57
27	4.23	2.40
28	5.25	3.26
29	6.25	4.16
30	7.21	5.10
31	8·11	6·06

CORRECTION IN MINUTES FOR SOUTHERN DISTRICTS.

Charleville + 27; Cunnamulla + 29; Dirranbandi + 19;
Quilpie + 35; Roma + 17; Warwick + 4.

CORRECTIONS IN MINUTES FOR CENTRAL DISTRICT.

Date.	Emerald.		Longreach.		Rockhampton.		Winton.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	+ 12	+ 26	+ 28	+ 42	+ 2	+ 17	+ 31	+ 49
6	+ 13	+ 26	+ 27	+ 42	+ 3	+ 17	+ 32	+ 49
11	+ 21	+ 17	+ 37	+ 33	+ 12	+ 8	+ 43	+ 37
16	+ 28	+ 13	+ 43	+ 26	+ 18	+ 1	+ 50	+ 29
21	+ 25	+ 15	+ 41	+ 31	+ 16	+ 6	+ 47	+ 35
26	+ 14	+ 23	+ 29	+ 39	+ 4	+ 14	+ 33	+ 44
31	+ 12	+ 27	+ 28	+ 43	+ 2	+ 18	+ 31	+ 50

CORRECTIONS IN MINUTES FOR NORTHERN DISTRICTS.

Date.	Cairns.		Cloncurry.		Hughenden.		Townsville.	
	Rise.	Set.	Rise.	Set.	Rise.	Set.	Rise.	Set.
1	+ 10	+ 47	+ 38	+ 62	+ 23	+ 47	+ 10	+ 39
3	+ 9	+ 49	+ 37	+ 63	+ 22	+ 48	+ 9	+ 40
5	+ 14	+ 46	+ 40	+ 62	+ 25	+ 47	+ 12	+ 39
7	+ 20	+ 39	+ 44	+ 57	+ 29	+ 42	+ 18	+ 34
9	+ 23	+ 32	+ 46	+ 52	+ 32	+ 37	+ 21	+ 28
11	+ 32	+ 23	+ 53	+ 46	+ 38	+ 32	+ 29	+ 21
13	+ 40	+ 16	+ 57	+ 41	+ 42	+ 26	+ 34	+ 15
15	+ 46	+ 9	+ 62	+ 36	+ 47	+ 23	+ 39	+ 10
17	+ 50	+ 8	+ 64	+ 36	+ 48	+ 22	+ 42	+ 9
19	+ 47	+ 12	+ 63	+ 38	+ 47	+ 24	+ 40	+ 12
21	+ 41	+ 20	+ 58	+ 44	+ 43	+ 29	+ 35	+ 18
23	+ 30	+ 30	+ 51	+ 50	+ 36	+ 35	+ 26	+ 25
25	+ 21	+ 34	+ 44	+ 54	+ 30	+ 38	+ 18	+ 29
27	+ 13	+ 43	+ 39	+ 59	+ 24	+ 44	+ 12	+ 36
29	+ 9	+ 46	+ 37	+ 62	+ 22	+ 47	+ 8	+ 39
31	+ 10	+ 49	+ 38	+ 63	+ 23	+ 48	+ 10	+ 40

NOTE.—The plus sign (+) means later than Brisbane time.

PHASES OF THE MOON.

Last Quarter, 8th December, 12.57 a.m.; New Moon, 16th December, 12.34 a.m.; First Quarter, 23rd December, 1.54 a.m.; Full Moon, 30th December, 12.38 a.m.

DISCUSSION.

On 22nd December the sun rises and sets about 25 degrees south of true east and true west respectively. This is the maximum angle the sun rises and sets south of east and west in Queensland.

On 23rd December the moon rises and sets almost at true east and true west respectively.

Venus.—All this month this planet will still be visible in the early evening, at the beginning of the month setting in Queensland generally soon after 9.30, about 25 degrees south of true west, in the constellation of Sagittarius and by the end of the month setting before 10 o'clock 15 degrees south of true west in the constellation of Capricornus.

Mars.—Still too close in line with the sun for observation.

Jupiter.—This planet, at the beginning of the month in the constellation of Virgo, rises soon after midnight 3 degrees north of true east. At the end of the month it rises just before midnight 2 degrees north of true east still in the constellation of Virgo.

Saturn.—At the beginning of December Saturn rises, in Queensland generally, a little before 9 o'clock 23 degrees north of true east and at the end of the month it rises near sunset. During the month then in the constellation of Gemini it will be visible practically all night.

The Southern Solstice.—Those who have been following the direction of the sun at rising and setting will have noticed that the angle south of true east and true west has been gradually increasing. During December and early January, however, it will be observed that there is practically no change in the direction of sunrise and sunset, and

It was from this apparent "standing" of the sun as it reaches its maximum angular distance south or north of the celestial equator that the phenomenon was termed "Solstice," from Sol—the sun, and sister—to stand still. The angular distance south or north of the celestial equator is known as declination. It corresponds to latitude measured on the earth's surface. On 22nd December, 1944, at 9 a.m. eastern Australian standard time (11 p.m. 21st December Greenwich time), the sun will reach its maximum declination south—23 degrees 27 minutes—and on the day of the solstice, from all places on earth, the angle south of east and west, of the sun at rising and setting, will be greatest. Again, Rockhampton, Emerald, and Longreach are at latitudes 23 degrees 23 minutes south; 23 degrees 32 minutes south and 23 degrees 27 minutes south respectively, and the sun when at this solstice, on its apparent journey from sunrise to sunset, passes very nearly overhead at these places—a vertical stick, at noon, at any of the three towns, throwing no shadow. (A reminder is given that noon does not always occur at 12 o'clock. In Queensland, noon occurs from half an hour before 12 to one hour after 12.) South of latitude 23 degrees 27 minutes, the noon-shadow is ALWAYS towards the south, but its length is shortest on this day. North of that latitude, however, the direction of the shadow at noon is towards the south when the southern latitude of the observer is of greater value than the southern declination of the sun, and towards the north when the southern latitude of the observer is less in value than the southern declination of the sun. At the southern solstice, then, for all places north of latitude 23 degrees 27 minutes south, the direction of the shadow at noon is towards the north and its length in this direction at its maximum. After 22nd December the sun appears to move north, the angle south of east and west at rising and setting, decreases; in places south of latitude 23 degrees 27 minutes south the noon-shadows lengthen; at Rockhampton, Emerald, and Longreach noon-shadows appear, and at places north of latitude 23 degrees 27 minutes south, the length of noon shadows in a northerly direction decrease, changing as the months advance from a northerly direction to a southerly direction. This changing of declination of the sun is brought about by the tilt of the earth to the plane of its revolution round the sun. With a light or some object to represent the sun placed on the surface at the centre of a table, and an apple or orange with a stick or pencil passed through the centre to represent the earth, and poles of the earth, the variation in the sun's declination may easily be illustrated. Mark one end of the stick to represent the north pole and the other end the south pole, and by a line round the middle of the orange divide the southern hemisphere from the northern. Place the orange at the edge of the table with the stick tilted from an upright direction. (The poles of the earth are tilted 23 degrees 27 minutes.) On moving the orange round the table, KEEPING THE STICK TILTED IN THE SAME DIRECTION, it will be seen that for part of the way round, the light shines over the Southern Hemisphere and, for part of the way, over the Northern Hemisphere. Another feature of the changing declination of the sun is the variation in the length of time the sun is above the horizon. Everyone knows how in summer time the sun rises earlier and sets later, and it seems the curiosity of all to know which is the shortest or longest day. To those in the Southern Hemisphere the length of the days increase as the sun appears to move south. At the southern solstice, then, when the sun is at its maximum declination south, the Southern Hemisphere will have its "longest day." The difference for a few days before and after the day of the solstice, however, is scarcely noticeable.

Supplied by the Astronomical Society of Queensland.

QUEENSLAND WEATHER IN NOVEMBER.

During the first three weeks of the closing spring month there was a marked and rapid deterioration of already adverse seasonal conditions. In the last nine days, however, substantial relief rains fell over the greater part of the south-eastern agricultural and dairying areas, and a number of central and southern inland pastoral districts were favoured with beneficial storms. Thus the month closed with the seasonal outlook vastly improved to reasonably good in most of the south-eastern divisions, but, except in very scattered areas, with the need of good general precipitation in the sub-tropical interior (especially southern border districts west from the Downs), and over the northern half of the State, very acute.

Temperature.—Except on the tropical coast, both maximum and minimum temperature means were over average, especially the day values. At Winton and Richmond, century readings (mostly 102 degrees to 109 degrees) were recorded on twenty-one days and twenty days consecutively (after the 9th) and at both places the mean maximum for this period was 104 degrees (5 degrees above normal); Thargomindah's mean maximum for the whole month (97 degrees) was also 1 degree over average. At Goondiwindi 111 degrees (the highest reported for the State) on the 19th equalled the November record for that place; it was preceded by 110 degrees on the 18th and followed by 108 degrees on 20th. Nights were unseasonably chilly in the Granite Belt.

The rain position is summarised below:—

Division.	Normal Mean.	Mean November 1944.	Departure from Normal.
	Points.	Points	Per cent.
Peninsula North	199	9	95 below
Peninsula South	220	105	52 ,,
Lower Carpentaria	148	49	67 ,,
Upper Carpentaria	153	28	82 ,,
North Coast, Barron	298	55	82 ,,
North Coast, Herbert	353	42	88 ,,
Central Coast, East	206	21	90 ,,
Central Coast, West	161	51	68 ,,
Central Highlands	220	133	40 ,,
Central Lowlands	148	33	78 ,,
Upper Western	105	12	90 ,,
Lower Western	89	10	89 ,,
South Coast, Port Curtis	272	112	59 ,,
South Coast, Moreton	357	300	16 ,,
Darling Downs East	277	170	39 ,,
Darling Downs West	232	101	56 ,,
Maranoa	211	81	62 ,,
Warrego	147	86	41 ,,
Far South-West	109	25	77 ,,

Commonwealth Meteorological Bureau, Brisbane.

RAINFALL IN THE AGRICULTURAL DISTRICTS.

OCTOBER RAINFALL.

(Compiled from Telegraphic Reports).

Divisions and Stations.	Average Rainfall.		Total Rainfall.		Divisions and Stations.	Average Rainfall.		Total Rainfall.	
	Oct.	No. of years' records.	Oct., 1944.	Oct., 1943.		Oct.	No. of years' records.	Oct., 1944.	Oct., 1943.
North Coast.	In.		In.	In.	*South Coast—contd.*	In.		In.	In.
Atherton	0·90	42	0·74	1·39	Gatton College ..	2·06	44	0·76	10·59
Cairns	2·06	61	1·97	2·59	Gayndah	2·37	72	0·58	8·42
Cardwell	1·95	71	1·42	2·81	Gympie	2·73	73	1·58	5·88
Cooktown	1·00	67	0·48	2·60	Kilkivan	2·68	62	0 58	4·76
Herberton	0·93	57	0·59	0·34	Maryborough ..	2·73	72	1·21	5·46
Ingham	1·80	51	1·35	1·92	Nambour	3·23	47	1·99	9·94
Innisfail	3·12	62	2·96	9·99	Nanango	2·19	61	1·03	4·63
Mossman	2·59	19	2·59	4·50	Rockhampton ..	1·78	72	0·63	3·32
Townsville	1·25	72	0·47	0·07	Woodford	2·53	55	2·42	7·43
Central Coast.					*Central Highlands.*				
Ayr	0·87	56	0·43	0·64	Clermont	1·28	72	0·06	1·70
Bowen	0·97	72	0·12	0·09	Springsure	1·62	74	0·16	3·90
Charters Towers ..	0·71	61	1·42	1·59					
Mackay	1·76	72	0·46	2·50	*Darling Downs.*				
Proserpine	1·53	40	0·50	1·37	Dalby	2·01	73	0·79	4·62
St. Lawrence ..	1·76	72	0·50	3·28	Emu Vale	2·18	47	0·89	3·23
					Jimbour	1·88	64	0·61	3·75
South Coast.					Miles	2·00	58	0·82	2·44
Biggenden	2·49	44	0·72	6·43	Stanthorpe	2·50	70	1·10	3·11
Bundaberg	2·07	60	1·28	10·23	Toowoomba	2·54	71	0·81	5·05
Brisbane Bureau ..	2·54	91	1·49	8·08	Warwick	2·32	78	1·23	3·05
Caboolture	2·73	67	2·75	8·06					
Childers	2·71	48	1·21	4·97	*Maranoa.*				
Crohamhurst	3·38	50	3·02	8·35	St. George	1·29	62	0·38	0·23
Esk	2·60	56	1·43	6·20	Roma	1·73	69	0·63	1·58

CLIMATOLOGICAL TABLE FOR OCTOBER.

Compiled from Telegraphic Reports.

Divisions and Stations.	Atmospheric Pressure. Mean at 9 a.m.	Shade Temperature.		Extremes of Shade Temperature.				Rainfall.	
		Mean Max.	Mean Min.	Max.	Date.	Min.	Date.	Total.	Wet Days.
Coastal.	In.	Deg.	Deg.	Deg.		Deg.		Points.	
Cairns	..	84	68	89	28	61	3	197	11
Herberton	..	76	57	85	3	51	12	59	3
Townsville	..	83	66	91	17	58	18	47	5
Brisbane	30·12	78	59	84	28	51	19	260	6
Darling Downs.									
Dalby	..	81	52	91	11	36	19	79	3
Stanthorpe	..	75	42	84	22	28	19	110	5
Toowoomba	..	74	50	81	16, 22	40	19	81	5
Mid-Interior.									
Georgetown	29·96	94	65	101	28	55	11	47	2
Longreach	30·09	91	61	99	11	50	4	25	2
Mitchell	30·09	84	51	94	15	37	19	82	2
Western.									
Burketown	..	92	68	100	28, 29	60	4	Nil	..
Boulia	30·00	91	62	101	13	51	3	54	2
Thargomindah	30·05	87	63	102	14, 15	49	4	Nil	..

A. S. RICHARDS, Divisional Meteorologist.

Commonwealth of Australia,
Meteorological Bureau, Brisbane.